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ABSTRACT

Twelve divisions and institutes of the National Institutes of Health (NIH) cosponsored this conference to examine the barriers to participation of Puerto Ricans in the United States to careers in science and biomedicine. Areas addressed during the conference included: (1) perspectives from the NIH; (2) historical and modern perspectives of Hispanic contributions to American life; (3) statistical profile of enrollments, degrees, and science/engineering labor force (including 15 tables); (4) education of Puerto Ricans in the United States; (5) status of science in Puerto Rico; (6) organizing Puerto Rican scientists; and (7) recommendations, including those relating to pre-college education, college and graduate education, employment and professional status, compiling a directory of Puerto Rican scientists and engineers, and establishing a network of Puerto Rican scientists, engineers, and students. (SK)

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Puerto Ricans in Science and Biomedicine

Report of a Conference

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American Association for the Advancement of Science
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PUERTO RICANS IN SCIENCE AND BIOMEDICINE

REPORT OF A CONFERENCE

Prepared by
Office of Opportunities in Science
American Association for the Advancement of Science

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National Institute of Allergy and Infectious Diseases
National Institute of Arthritis, Metabolism and Digestive Diseases
National Institute of Child Health and Human Development
National Institute of Dental Research
National Institute on Aging
National Eye Institute
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ISLA VERDE

Verde verde es esta isla
Isla Verde así te llamas.
Verde del mangle calado
sobre la playa dorada.

Ribera orlada de sol
y de penachos de coco,
de bohios calcinados
por el salitre del mar
olorosos a tabaco
a ron y café tostado,
arrullados por la brisa
y los cantos del coquí.

Veredas que de a uno en fondo
caminaban tus tipleros
cuando la luna era llena
y era noche de domingo.

Hace apenas medio siglo
así estaban tus riberas
caminadas por tus gentes
que bien sabían por qué
te llamaban Isla Verde

Ya hoy en amplias avenidas
se ensancharon tus veredas.
Ya el mangle no cala verde
ni tus tipleros caminan
de a uno en fondo los domingos.

Ya tus bohios dejaron
el paso a los rascacielos
donde el olor a tabaco
a ron y a café tostado
se evapora por los tubos
del aire acondicionado.

Ya no se eschucha el murmullo
de tu brisa tropical.
En vez se oye el rugir
de cien aviones a chorro
que a tus playas aterrizan
quemando el mangle y la brisa
y fastidiando al coquí.

Te has convertido en jungla
de cabarets y posadas,
de música complicada
de jergas incomprensibles.
Ya no eres isla, eres jungla.
Ya no se sabe por qué
te llamaron Isla Verde.

Manuel García Morín
(Magamó)
1963

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PUERTO RICANS IN SCIENCE:
Report of a Meeting Held April 22-24, 1981
Bethesda, Maryland
conducted by the Office of Opportunities in Science
American Association for the Advancement of Science

Esta ponencia de la reunión de abril de 1981 resume los discursos dados y los debates sostenidos durante esta sesión. Los resúmenes de los debates incluyen información sobre algunas de las recomendaciones del grupo. La mayoría del material presentado en esta ponencia puede encontrarse en forma íntegra en otras partes de este libro.

Twelve divisions and institutes of the National Institutes of Health cosponsored this conference* to examine the barriers to participation of Puerto Ricans in the United States to careers in science and biomedicine. Thirty-five senior Puerto Rican scientists took part in the session, virtually all working in biomedical fields. Four were employed at universities on the island of Puerto Rico, and the others worked in scientific settings on the mainland, including positions in government, academe, and the private sector. Twenty science students of Puerto Rican heritage were also active participants; they were enrolled in mainland graduate and undergraduate programs, many of them doing research under Minority Biomedical Support Program (MBS) or Minority Access to Research Careers Program (MARC) auspices. Also contributing to the meeting were a number of NIH staff members, several Puerto Ricans who work closely with scientists although not trained in those fields, AAAS staff, and a few observers from federal agencies interested in the theme of the conference. The meeting consisted of small workshops alternating with plenary sessions.

At the opening plenary session, S. Maria Hardy (Associate Professor of Physiology at Louisiana State University, Shreveport, and Chair of the Conference) outlined the history of concern and involvement by Puerto Rican science professionals that led to the conceptualization and convening of this conference. She noted the AAAS role in many of these activities including the minority women scientists conference, the informal meeting of Puerto Rican scientists in New York in 1976, the Puerto Rican membership on the AAAS Committee on Opportunities in Science and the Puerto Rican directory project. She charged the conferees to utilize the opportunity which had been provided them by the NIH to examine the barriers to their participation in science, and to formulate a course of action that would lead to advances in biomedical careers.

Zora Griffo, Special Assistant to the Director, NIH, outlined the history of concern by the National Institutes of Health for groups underrepresented in biomedical

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*Division of Research Resources, Division of Equal Opportunity, National Cancer Institute, National Institute of General Medical Sciences, National Institute of Neurological and Communicative Disorders and Stroke, National Institute of Allergy and Infectious Diseases, National Institute of Arthritis, Metabolism and Digestive Diseases, National Institute of Child Health and Human Development, National Institute of Dental Research, National Institute on Aging, National Eye Institute, Fogarty International Center.

research. She noted the need to understand the particular barriers to career entry by the various groups and indicated that NIH's mission required that it attend to the development of needed talent from all segments of the population. Both speakers noted that the decision to go forth with such efforts was a sign of NIH's perception of the importance of this part of its mission in view of the hard choices being made in a time of budget cutbacks.

In the following plenary session which was chaired by Yvonne Benner of the Office of Personnel Management, the conferees reviewed issues relating to Puerto Ricans in science as suggested by a series of background papers distributed in advance of the meeting. Pedro Barbosa, Professor of Entomology, University of Maryland, analyzed the status of Puerto Rican scientists in the continental United States. Utilizing some statistics from a paper prepared for the conference by Betty Vetter of the Scientific Manpower Commission, he noted the higher concentration of Hispanic Bachelor's, Master's and Doctoral degree recipients in the social and behavioral sciences, and the more severe underrepresentation in the mathematical and physical sciences. In employment, Hispanics are only 1.5% of the nation's faculty, but 5.6% of the U.S. population. In 1976, less than 4% of the Puerto Ricans in the U.S. labor force had completed four or more years of college. Of all science and engineering doctorates in the U.S. in 1979, only .8% were Hispanic. In federal employment, Hispanic workers in 1978 were 1.0% of all physical scientists, 1.5% of the engineers, 2.3% of the health and biological scientists, and 1.8% of those in mathematics and computer science. Barbosa summarized Vetter's critique of data gathering on Hispanic scientists; since too little was known about their education and employment in general, and virtually nothing was available on patterns within the Hispanic groups, we cannot make firm policy decisions based on quantitative data alone. Hispanic students certainly were being provided with few role models of working Hispanic scientists, and non-Hispanics were not being exposed to the idea that Puerto Ricans and other Hispanics were fully capable of holding scientific jobs.

Manuel Gomez Rodriguez, Director of the Resource Center for Science and Engineering at the University of Puerto Rico, Rio Piedras, outlined scientific institutions, education and research on the island. He noted the doubling in college enrollments on the island between 1969 and 1979. About 18% of the students are enrolled in science related programs. The rapid expansion in student numbers and curricular offerings has led to the hiring of many professors at less than doctoral levels. This doctoral shortfall, in turn, has prompted Puerto Rican universities to support graduate fellowships and training at greater levels than in the past. The extra graduate students and the greater availability of some targeted research money for minority institutions has increased research productivity in Puerto Rico. Gomez noted the importance of the MARC and MBS programs of NIH, plus support from NSF and the Department of Energy. He documented the effect of such targeted efforts with data on numbers of papers published by island scientists in refereed journals. Gomez contrasted this to the mainland picture of declining enrollments, aging and stagnant faculty, surplus doctorates, and slowing support for research. He suggested that Puerto Rican entry into industrial society from an agricultural past, and the high birthrate on the island, are two important explanations for the difference between the status of science on the mainland and the island. The intensity of Puerto Rican growth in the sciences has offered great opportunities for women to enter these fields, he remarked, leading to parity rarely seen in scientific fields on the mainland. Not that science on the island was problem-free. Precollege teaching of science and mathematics is poor: teachers can get better jobs elsewhere (especially in industry) if trained in technical fields, and those who remain in the classroom are apt to be credentialed in non-science areas. Remedial work is needed by many college students, which the universities provide in good part

through computer aided and television instruction. Gomez also said that not all island colleges were as well endowed to do science training and research as Rio Piedras.

Rafael Valdivieso, director of the Center for Educational Equity of ASPIRA, reviewed educational policy and research on education as it related to minority students in general and Puerto Ricans in particular. He found that programs and research supposedly related to Hispanics or Puerto Ricans had often been "add ons" to work designed for other populations. Educators and policymakers tended to regard Puerto Rico as a state whose denizens spoke a foreign language, and mainland Puerto Ricans as indistinguishable from other Hispanic Americans. The result was outright conflict in some policy and research results, or at best, confusion and gaps in services for Puerto Rican students. Valdivieso reviewed the existing literature on Puerto Rican education. Retention studies gave suggestive but inconclusive results because they aggregated Hispanics. Achievement studies showed greatest disparity between Hispanic and non-Hispanic seventeen year-olds in the Northeast, again intriguing but indirect evidence on Puerto Ricans. He also found ambivalence on attitudes toward the success and fate of bilingual education, stemming from the costs of such programs, American uncertainty about the role of language in the nation's culture, and allegations that research had not shown bilingual instruction to be beneficial to students. Valdivieso was not surprised to find only partial compliance with Office of Civil Rights (OCR) directives on bilingual education throughout U.S. schools. Some detailed studies have been done on the degree to which Puerto Rican students attend segregated schools, but it revealed many differences between and within cities. The trend, however, seemed toward increasing segregation of Puerto Ricans, not integration. If further research confirms this finding, court action might be required for remedy.

Candida Acosta, Dean of Academic Affairs, University of the Sacred Heart in Santurce, Puerto Rico, and Harold Stolberg, Program Manager, Development in Science Education, NSF (on leave from the University of Puerto Rico) dealt with role modeling and stereotyping as it related to Puerto Ricans in science. They noted that stereotypes often contain a germ of truth—the notion that "Puerto Ricans are incapable of being scientists" stems in part from the fact that so few have been encouraged to follow such occupations. The paucity of Puerto Rican scientists made it hard for teachers to provide role models, they said, linking the stereotype/model problems. They asked the group to rethink the idea that only visible, nationally known persons make good role models. Often a scientist pursuing a less intense career than a Nobel prize winner made a more realistic model, one with whom students could truly identify.

Three panelists reviewed science programming for Puerto Ricans—Shirley Mahaley Malcom (Program Head, AAAS Office of Opportunities in Science), Elward Bynum (Director, MARC Program, NIH), and Ciriaco Gonzalez (Director, MBS Program, NIH). Bynum reviewed the features of the MARC Program at NIH, indicating the opportunities it provided to minority students to receive training in biomedical careers. Gonzalez outlined the major features of the MBS Program and the role it has played in enhancing biomedical research in institutions which train significant numbers of minority students. The work of Geraldine Woods, consultant to NIH and conference observer, in the establishment of the major minority focused efforts at NIH was noted.

Malcom, in reviewing other targeted programs in the Department of Health and Human Services and in other agencies, remarked on the elimination and/or cutbacks in most such efforts. She said that the role of targeted programs and those aimed at capacity building have not been appreciated in the recent round of budget cuts, noting that the lack of clout of those affected or the failure to use the political clout which does exist has made budget cutters fearless in their attack on minority science programs.

All panelists indicated the need to move toward mainstream programs and participation in the full range of professional science activities in the science focused agencies and departments.

On the following day, the scientists divided into five workshops to detail solutions to the issues raised in earlier deliberations. The groups considered precollege education, college education, graduate and professional education, employment, and professional status. Several themes emerged: the need for an organization of Puerto Rican scientists and engineers, for example. The workshop participants were conscious of the need to propose programs in the face of limited government budgets; often, they recommend that greater parity between Puerto Ricans and others could be achieved by surveying existing resources and projects and advertising them more widely among Puerto Ricans, or by adjusting the program to make certain it was accessible to Puerto Ricans.

The precollege workshop delved into the problem of "tracking" students by academic level. They identified two problems that this raised for Puerto Rican students. First, a disproportionate number of Puerto Rican students ended up in the lowest track, not because of lack of ability but because of imperfect testing or bias. Second, the workshop said that the lowest track students, regardless of ethnic heritage, often had incredibly poor instruction, despite the fact that their level of performance indicated the need for greater resource allocation from educators. This workshop also recommended emphasis on mathematics preparation for Puerto Rican students as crucial for any modern day career, but particularly for those jobs which were science related. They asked Puerto Rican scientists themselves to monitor school policy in their home towns, to serve as role models for youth, and to inspire and motivate students in their community. Americo Rivera of NIH led this workshop discussion.

The college workshop was headed by Clara Rodriguez, Dean, School of General Studies, Fordham University. Her group recommended that a revised directory of Puerto Rican scientists be more inclusive of college students, indexing them by discipline and instruction. They deplored the effect of forthcoming budget cuts in federal funding for science education and health training, remarking that the stringency was coming just at the time when Puerto Rican and other Hispanic students were finally receiving benefits from such nationwide efforts. Finally, they asked for scholarship funds for Puerto Rican science students, possibly raised by a group of Puerto Rican scientists.

Cesar Rodriguez and James Lugo, graduate students at Brandeis and the Massachusetts Institute of Technology (MIT) respectively, led the graduate education workshop. The members called for better preparation of Puerto Rican students regarding testing procedures for entry into professional and graduate training. They saw a need for better briefing of graduate students in the skills which make scientists employable: resume drafting, interview techniques, and the like. They thought graduate schools could do a better job of informing Puerto Rican students of financial aid opportunities. They urged colleges to encourage undergraduates to obtain research experience before going to graduate school, as a realistic taste of what scientific life is like.

The employment workshop, chaired by Teresa Mercado of NIH, began by remarking on the importance of networking as a means of finding a job and seeking better positions within one's firm or agency. They suggested that Puerto Rican science students prepare themselves for the world of work not just by acquiring technical competence, but also by obtaining the broad experience and learning offered by a liberal arts curriculum. The workshop recommended that students—college as well as graduate—attend scientific meetings to build up professional contacts and to see how scientists conduct their business. The scientists asked for wider distribution of information about job openings,

still too often filled by the clandestine cliques of decades past. The workshop asked professional scientific organizations to meet needs of aspiring women scientists by providing childcare during sessions.

Rafael Igartua, a physician (internal medicine), guided the discussion on professional status. The group detailed the format for an expanded and revised directory of Puerto Rican scientists and engineers. They thought professional scientists should devote some of their time to improving science education for Puerto Rican high school and college students, and echoed some of the program recommendations from the workshops for those levels. They also recommended that professional status in the Hispanic and non-Hispanic community could be enhanced by promoting science to community organizations such as churches and clubs.

Following the workshops was a student/scientist panel involving two undergraduates, two graduate students, one reentry student, and two professional scientists. In this informal session, panelists discussed their educational experiences, career aspirations, research interests and future goals. The panel touched off a lively discussion involving all the conferees on various concerns related to pursuing a scientific career: financial resources, contributions of family and other support groups, and combining professional with personal life.

The conferees reconvened after the student/scientist panel to start work on creating regional networks of Puerto Rican scientists and engineers. They roughed out the boundaries each network should cover, and found volunteers to start work in several of the regions. They asked the regional coordinators to assemble again in Washington in January, 1982 to share experiences and to consider what kind of national organization would be supported by the networks. They asked that news of their decision to start networks be broadcast in the press release on the conference. The scientists authorized the Office of Opportunities in Science of the AAAS to serve as a "mailbox" for communication among network coordinators until a national Puerto Rican scientists' association took over that function.

Two speakers tied together many features of the Puerto Rican experience in America in general and in science in particular. Major General Enrique Mendez, Deputy Surgeon General of the United States Army, encouraged scientists and students alike to take pride in their Hispanic roots, noting the tremendous contributions made by Hispanics to the development, growth, advancement, culture and heritage of the United States. He urged all to let that knowledge and pride in Hispanic contributions to America take them forth in pursuit of the goals of the conference. Dr. William Raub, Associate Director for Extramural Research of NIH, noted the tremendous human resources offered by Hispanic scientists to the solution of biomedical problems. In keeping with NIH's desire to nurture and encourage these efforts, they are taking a critical look to see just how they might work with the University of Puerto Rico (UPR) medical campus in helping it to fully realize its potential as an important center for biomedical research and training.

INTRODUCTION TO CONFERENCE

S. Maria Hardy
Conference Chair and Chair, American Association for the Advancement of Science Committee on Opportunities in Science

Se presenta un panorama histórico de los sucesos desde 1976 que llevaron a la Conferencia de Portorriqueños en la Ciencia y la Biomedicina de abril de 1981. Se destaca en estas observaciones de introducción la influencia de las organizaciones científicas y de ingeniería hispánicas así como el papel de la American Association for the Advancement of Science para servir a la comunidad científica portorriqueña.

Good afternoon. Dr. Martin Luther King had a dream. To me this conference is a dream come true. I bid you welcome on behalf of the AAAS, the Office of Opportunities in Science and its advisory committee, as well as our sponsors, the National Institutes of Health.

I come to you not only as a member of the committee of the Office of Opportunities in Science, but specially as a Puerto Rican scientist born in Boriquen and transplanted to the mainland.

At this time, I would like to give you a personal historical background to this conference. Some years ago, circa 1973, the President's Cabinet Committee on Opportunities for Spanish Speaking People met in Washington with scientists and engineers representing the Chicano, Cuban, and Puerto Rican populations. At that time it became apparent that we were not as organized or united as were our Cuban colleagues or the Chicanos. The progress of the latter group was evident by the newly formed Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) and the Society of Hispanic Professional Engineers (SHPE). Both of these groups are very active and their presence is felt mainly in the Southwest and the West Coast. On the East coast, the Society of Spanish Engineers, Planners, and Architects (S/SEPA) shortly followed suit. Eventually, the Association of Psychologists for La Raza was formed in the West while the East had an Association of Health Professionals. Seeing the diversity of the various groups, it was necessary to have a Puerto Rican scientist who could serve as a coordinator to distribute information from these organizations. Thus, at that 1973 conference, Pedro Barbosa and myself were volunteered to serve in that capacity. This soon proved to be a very difficult task since we knew few of the Puerto Rican scientists on the mainland.

While other minorities were increasingly active, the Puerto Rican Engineering and Scientific Society (PRESS) was established with the able leadership of Angel Rivera and his colleagues. This was mostly an engineering group, active mainly in the New York and New Jersey metropolitan area.

In 1975, OOS sponsored a conference of minority women scientists. As a direct result of that conference, five Puerto Rican participants assisted the Office of Opportunities in Science in the preparation of a 1976 May meeting of Puerto Rican scientists and engineers in New York City. You have in your background materials the report of that meeting. Subsequently, Pedro Barbosa, Luis Nieves and myself were asked to serve the Committee on Opportunities in Science (COOS) as Puerto Rican panelists. The following year, Luis Nieves and I were invited to be members of COOS.

It was soon very clear to both Luis and me that we could not speak in true faith for the Puerto Rican scientific community. We did not know who we were, where we were, what were our fields of expertise, and most of all, what were our wants and needs. We asked COOS that the primary concern of the May 1976 participants, namely, the preparation of a Directory of Puerto Rican Scientists and Engineers, be dealt with. The sole purpose of the Directory was its distribution only among the scientists and engineers mentioned in the Directory. It was also used to serve as a pool for the development of this conference as suggested by some of you, especially Mabelle Giraldo. The possibility of using this Directory to establish regional networks was also contemplated.

Thus, with the full endorsement of COOS, the staff, and the support and encouragement of William Carey, Executive Officer of AAAS, monies were allocated to fund such an enterprise. In spite of many odds and obstacles, Yvonne Benner and Michele Aldrich were able to compile such a directory which is now out of date.

As you can see, it has taken several years, much dedication and hard work to get this conference under way. It is also to be noted that most of the work has been done by our friends and colleagues who do not happen to be Puerto Rican. The members of OOS and its advisory committee felt our needs must be met. The proposal was prepared, and in a year of drastic cuts in the federal budget, it is gratifying to note that the many institutes and divisions of the National Institutes of Health are supporting this conference.

The many Whites, Chicanos and Blacks who have worked for this day do not wish to speak for us. They want us to stand and be counted. When we speak of Hispanics, we speak of all our brothers and sisters having a common language and cultural heritage. But as Hispanics, we do not address the special needs of Puerto Ricans, the problems of the Cubans in the Southeast, or the problems of the Chicanos in the Southwest. Thus, it is of importance that we meet as Puerto Ricans at this, our first national gathering.

This meeting provides a wonderful opportunity to meet each other, to explore our experiences both here and on our island, to increase and strengthen the ties between the Puerto Rican scientists here and in Puerto Rico, to develop strategies to increase the participation of Puerto Ricans in science and engineering at all levels and in all fields, thereby increasing our effectiveness and visibility, of being full participants in our chosen fields. Let's make the words written in our diplomas and scientific organization certificates, "and is fully entitled to all the privileges granted by...", a reality.

The time has come for you to let your feelings and wishes be known to decide what are the next steps to be taken to achieve our goals. I trust that a spirit of cooperation will be prevalent. I ask you to look beyond your special individual needs and direct your sights to our needs as well as our role in the larger pool of all minorities. Let us learn from the successes and mistakes of our brothers and sisters, the Native Americans, Chicanos, Cubans and Blacks. Let us not be destructive, but constructive. Let us be not only self supportive, but also let us identify with the aspirations of other minorities. At such critical times as these, we need each other. Let us get out of the woodwork and pay our dues.

We are indeed fortunate in having many young people participating at this meeting. Let us give them a solid and positive foundation so that they can assume

the leadership of tomorrow. Let us share our experiences with them. Above all, let us not forget where we came from, our island.

Thank you.

NIH PERSPECTIVE

Zora J. Griffo
Special Programs Officer
National Institutes of Health

Se examinan las cuestiones que tienen influencia en la participación de portorriqueños en investigaciones biomédicas y temas relacionados desde el punto de vista científico, económico y social. Se presenta una lista de las áreas en las cuales NIH intenta continuar proporcionando financiamiento, así como un resumen de los programas y actividades pasados y presentes que estén dirigidos a las minorías. Por último, se describen los problemas sociales que afectan a la comunidad hispana.

It is a great pleasure to address you at this Conference of Puerto Rican Scientists - a meeting co-sponsored by the American Association for the Advancement of Science and twelve operating components, Institutes and Divisions of the National Institutes of Health which are dedicated to providing a forum for addressing the full range of issues that impact on the participation of Puerto Ricans in biomedical and related research. To address these issues, we will need to examine them from their scientific, economic, and societal perspectives.

As for science, never before has there been a more fertile period in the history of mankind for triggering an explosion of knowledge in the life sciences. And this coincides with less than four decades of decided public support through federal funds for biomedical research. Consequently, only the foundations have been laid — the greatest accomplishments in medicine are yet to come.

The economy, on the other hand, has never before been in a more serious situation than now. Due to conflicting demands on the federal dollar, we no longer expect increasing support for biomedical activities, but rather hope for stabilization buttressed by our careful stewardship of the scientific enterprise in the face of shrinking resources. Consequently, we are already coming to grips with this reality by identifying areas that will merit our greatest commitment throughout the 80's. We intend to continue:

- Supporting the full range of health related research, although some areas will be receiving a greater infusion than others.

- Upholding the scientific quality of research proposals as the single most important consideration in funding decisions.

- Protecting investigator-initiated research projects to ensure that a relatively stable number of competing proposals are funded each year. If necessary, we will achieve this at some expense to the other forms of research support, such as clinical trials, developmental work under contracts, categorical research centers, shared large resources, control programs, and other similar activities.

- Providing ample opportunities for new investigators to enter biomedical research. Contrary to a widely held belief, new investigators are competing

favorably with their senior colleagues for NIH support; we will make sure that these opportunities are not diminished in the years ahead.

- o Supporting, as best we can, our research manpower training programs. In our view, this is our most important priority next to maintaining individual investigator-initiated research projects.

- o Making every effort to draw more M.D.s into research. The number of clinical researchers has been decreasing during the past few years, resulting in an imbalance between basic and clinical research; we will make every effort to reverse this trend.

- o Looking for better ways to share large resources and improve the delivery of research results to the health care sector and the bedside.

- o Strenthening, and even developing, new relationships with industry, academia, and the community for the support of science.

As for societal issues, it is fair to say that scientists — and their federal sponsors as well — are so absorbed with the substance of science that they lag behind in resonating with the societal issues spreading throughout the world at the close of this century. Consequently, it took a long chain of events before we could fully appreciate the need for having all subgroups of the U.S. population, including minorities, women, and the handicapped, equally contribute to and benefit from the conduct of science.

During the last decade, NIH has taken steps to remedy past inequalities by establishing minority-oriented programs, including the Minority Biomedical Support (MBS) Program and the Minority High School Student Summer Research Apprenticeship Program of the Division of Research Resources; the Minority Access to Research Careers (MARC) Program of the National Institute of General Medical Sciences; the Cooperative Minority Programs through which other NIH Institutes fund parts of MBS or MARC-supported projects or fellows; the Minority Hypertension Research Development Summer Program of the National Heart, Lung, and Blood Institute; and the Extramural Associates Program administered jointly by the Office of the Director, NIH, and the Division of Research Grants.

Further, we significantly increased the participation of minorities and women on NIH advisory groups and are assembling a consultant file which will make such participation even more accessible.

We have also made specific progress with regard to Hispanics. The Minority Biomedical Support Program supports significant numbers of Hispanics; other NIH minority programs are following suit. To increase our understanding, we supported several conferences focusing on Hispanics both as contributors and beneficiaries of biomedical research. In September 1978, we convened a joint NIH-ADAMHA (Alcohol, Drug Abuse, and Mental Health Administration) Conference to explore both the critical health issues affecting Hispanics and the various means towards increasing the participation of Hispanics in biomedical research. In November 1980, thirteen NIH Institutes and Divisions sponsored a National Conference of the Society for Advancement of Chicanos and Native Americans in Science in Albuquerque, New Mexico. Earlier this month, key NIH officials visited the Medical Sciences Campus of the University of Puerto Rico to explore their current research activities and identify areas for further emphasis. From all accounts, this visit was highly successful.

From these conferences and other exchanges with Hispanic Americans, we have become sensitized to issues that affect the Hispanic community. We are now aware that:

- o There is a need for distinguishing subgroups among Hispanics and that measures directed toward increasing their participation in science must first address the specific problems encountered by Hispanic American subgroups - the Chicanos, Puerto Ricans, Cubans, and others.

- o There is a need for accurate statistics. Current statistics do not distinguish between native and foreign born Hispanic scientists and, consequently, do not reflect the underrepresentation of native Hispanic Americans in science.

- o There is a need for Hispanic American scientists to serve as role models - from impressing high school students with future careers in science to placing Hispanics in decision-making roles in the public and private sectors.

- o There is a need for more Hispanic scientists to engage in research, teaching, and administration.

- o There is a need for maintaining and strengthening the special minority programs such as those sponsored by NIH.

- o There is also a very important need to aid Hispanic scientists to make the transition from training to conducting independent research.

- o There is a need for elucidating the diseases and conditions that have a special impact on Hispanic Americans and for developing and introducing appropriate preventive measures.

We hope that this conference will be a catalyst for further exploring these and similar issues aimed at increasing our understanding of what needs to be accomplished in the decades ahead.

HISPANIC CONTRIBUTIONS TO AMERICAN LIFE:
HISTORICAL AND MODERN PERSPECTIVES
Remarks at the Conference by Major General Enrique Mendez, Jr.
Deputy Surgeon General
United States Army

Esta ponencia analiza las diferentes maneras en que la cultura hispana ha contribuido a la vida en los Estados Unidos, tanto en el pasado como en el presente. El autor presenta el rol histórico que jugó España y Cuba en la Guerra de la Independencia y el desarrollo subsiguiente de las colonias — la construcción de los ferrocarriles y proporcionando mano de obra para las industrias agrícolas en crecimiento. Detalla además la influencia latina hoy en día que puede observarse en los nombres de los estados y ciudades americanos, los estílos de vestimenta, arquitectura, alimentos, industria automotriz y del tabaco, el sistema legal (principalmente en el Suroeste), y el lenguaje, literatura, música y arte americano.

The roots are deep and the heritage is clear. The Spanish missionaries, soldiers and settlers came with Christopher Columbus and first touched on the islands of the West Indies. Some settled there, learning to live in these areas, mixing with the Indian inhabitants and, at times, exploiting their labor. Others advanced to the continental mainland, some to Mexico, clashing with Aztec culture and doing battle with its armies. Other expeditions headed north to areas beyond the Rio Grande to the Great Southwest and others went south to Central and South America. And all of this happened quickly and early (in the 1500s). Spanish power and influence subsequently waned, but the people that came explored, worked, settled and increased in numbers. Other expansions were occurring at the same time - pioneers were moving across the United States - west and toward the Pacific. Two cultures met, clashed and subsequently have tried to amalgamate.

One hundred years ago, Walt Whitman said, "I have an idea that there is much of importance about the Latin contribution to American nationality that will never be put with sympathetic understanding and tact on the record."

For some reason, many of us, perhaps because of some of our teachers, seem to believe that American History began at Plymouth Rock. In fact, during the years the Pilgrims were struggling with their colony in New England, cities were growing in Florida, in the Southwest and in Puerto Rico.

Whether we Americans are conscious of it or not - we enjoy a large Hispanic heritage.

The states of California, Arizona, New Mexico, Colorado, Nevada, Montana and Florida have Spanish names. There are over 1,000 cities, towns, counties and landmarks that also bear Spanish names. Today, Spanish is by far the most commonly spoken language, outside English, in the United States.

Some have heard that Ponce de Leon discovered Florida in 1513, but how many know that Hernando de Soto led an expedition in 1539 through Florida, present-day Georgia, North and South Carolina, Tennessee, Alabama, Mississippi, and Louisiana? After discovering the mouth of the Mississippi, his expedition continued through Arkansas

and Texas to Mexico. Shortly thereafter, Coronado led his expedition through the present states of New Mexico, Oklahoma and Kansas. Incidentally, the first non-native to see these present-day states was Coronado's most trusted scout, Estevanico, a Black who was eventually killed on a scouting mission.

Almost unrecorded in American history is that a Spanish pilot, Esteban Gomez, explored along the Eastern Seaboard as far north as Maine in 1525, discovering the mouths of the Connecticut, Hudson and Delaware rivers.

On the West Coast, Spanish explorers had reached San Francisco by 1542 and Oregon a year later, while Juan de Zalvidar penetrated to the present site of Denver in 1600.

Although frequently ignored by those who write history books, the oldest settlement under the U.S. flag is San Juan, Puerto Rico (1521), and the two oldest American cities are St. Augustine (settled in 1565) and Santa Fe (1610). Many other cities are of Spanish origin, of which the best known are Los Angeles, Pensacola, Mobile, San Antonio, San Diego, San Francisco, Albuquerque, Tucson, Monterey, and Santa Barbara. But how many people know that Dubuque (Iowa), Galveston (Texas), New Madrid (Louisiana) and Florissant (Missouri) are also Spanish in origin? Or that St. Louis was an important Spanish post at one time?

Five years ago we celebrated our Bicentennial year. Despite all the historical reportings, few Americans were aware that Spain also played an important role in the War of Independence. In 1776, King Carlos of Spain granted a credit of one million pounds - a large sum at that time - to the American colonists. Later, as the financial condition of the American Army became dangerously low, a French Admiral (de Grasse) went to seek funds in Cuba. French historians say that the money was collected in five hours from the public treasury and from private citizens of Havana.

While history takes ample notice of the French contribution to the American victory, it is very meager about substantial Spanish aid - both financial and military. Spanish ports in Europe and the Caribbean were opened as safe havens to harassed American shipping. In 1779, Spain declared war on Great Britain. A large Spanish fleet chased the English navy from the Gulf of Mexico, and Spanish troops based in New Orleans, commanded by Bernardo de Galvez, who was then Governor of Louisiana, conquered British troops at Baton Rouge, Fort Manchac, and Fort Panmure. With the help of his own soldiers, as well as Cuban troops and 600 Choctaw Indians, Galvez recaptured Mobile and Pensacola from the British. And, Spanish troops at St. Louis beat off a British attack in 1780 and gained command of the Mississippi.

These short historical highlights serve to introduce some of the contributions of Hispanics to our total way of life. I know of no way to divorce those contributions from the history of the country.

The horse was one of the most important Spanish imports to the southwestern United States. It provided the means of transportation for the conquistadores and for the transportation of supplies, settlers and the mobility of the Plains Indians. In the early 1600s, it was De Onate's expedition that brought grain seed into Texas and New Mexico and his livestock that dropped offspring along the way of the Camino Real (the Royal Road). Cattle and sheep came with him and the first herds spread across the land.

Religion and the friars were an important part of these movements - conversions of Indians, spread of the Catholicism of the Spanish, the development of missions and the teaching not only of religion but European customs, language and agriculture.

Missions stepstoned through the Southwest and through California - originally spurred on by Franciscan friars. We still know such names as San Luis Obispo, San Jose, San Juan Capistrano, and Concepcion Espada. The mission would have around it the "presidios" for soldiers' barracks, necessary public buildings and, in connection with it, a "rancho del rey" or "King's range" to pasture the horses belonging to the fort. Land grants could be authorized by the fort commanders and villages and towns were formed and thrived.

In the latter part of the nineteenth century, a new wave of Spanish-speaking immigrants was building up - Cubans came for cigar manufacturing in 1868 to Tampa, Florida. Basque herdsmen came to California, Oregon and inland to Idaho to lush sheep-grazing land. Puerto Ricans came then to California, some stopping in a roundabout way in Hawaii at the sugar cane fields.

The need of the railroad for labor started the twentieth century Mexican migration at El Paso in 1900. Cotton and further need for labor increased it. Because of inequity of pay and conditions, the first strike of Mexican sugar beet workers occurred in Ventura, California in 1903. The result was that they lost their jobs. Characteristically and for quite a few years later, the workers were brought in to do work that others would not do and at wages that others would not accept. The continuation of that history and the struggles that led to the status of today are, I am sure, known to all.

The largest Puerto Rican migration (all of whom were American citizens since 1917) to the continent occurred after World War II. Post war air transportation made travel easier. In 1946, 40,000 people came to New York. As the industrial tempo slowed, many returned but the migration restarted again in 1950, spurred by a manpower shortage in the continent. In 1951, 63,000 Puerto Ricans flew to New York. By 1953, every tenth resident in Manhattan Island was Puerto Rican. From Spanish Harlem to the Bronx, they crowded into tenements looking for better wages in garment industries, food and hotel industries, radio assembly, pharmaceutical laboratories and so on. They also had the expectation that as soon as their fortunes had bettered, they would return to the island. Others saw better opportunities than New York, and by 1953, there were 15,000 Puerto Ricans in Chicago, 4,000 in Bridgeport, Connecticut, and 2,500 in Philadelphia, etc.

These were then the settings for two of the larger groups (Mexican Americans and Puerto Ricans); settings in which there was some disunity among the groups composing the Spanish-speaking peoples and poverty and not many choices of types of jobs; settings that led to growing unity and a realization of a need for economic and political effectiveness; settings from which leadership and a definite thrust for socioeconomic parity were to emerge.

The language itself has influenced the life of all of us. In the New York subway, in a fine restaurant in San Antonio, in a supermarket in Miami, "se Habla español" is almost as common as English being spoken. Public schools in many communities have instituted programs of instruction in both Spanish and English. Many Spanish radio stations as well as television channels operating in Texas, California, Florida, Connecticut and New York are flourishing.

Many Spanish words have been absorbed into our daily language and some of the customs into our ways of living. For example, typical words of the Texas area are: savvy = saber; lasso = laso; spurs = espuelas; rancher = ranchero; chaps = chaparreras; dolly welter (which means to twist a rope around the horn of the saddle) = dale vuelta; also such words as stampede, siesta, adobe, hacienda, bronco, and canyon.

Cowboy dress (and of course today's western wear) and equipment from the hat to the horned saddle were derived from the Vaquero (Spanish for cowboy - origin of the word "buckeroo"). Even certain terms for weather conditions found in our hemisphere are derived from Spanish: tornado from tronada (thunderstorm) and hurricane from huracan (which is originally a Tairo Indian word for "evil spirit").

The popular word "mustang" comes from mestano. By the way, what would the U.S. auto industry do without Spanish names for its cars? Such names are Fiesta, Vega, Pinto, Seville, Monterrey, El Dorado, Ventura, Catalina and Cordoba (some of which get mispronounced and misspelled occasionally).

Hispanic contributions are found in many industries. The mining industry in this country benefited greatly from technology that was adopted wholesale, particularly from Mexicans and from Peruvians and Chileans who had been mining gold and silver since the sixteenth century. In the spring of 1842, a Mexican, Francisco Lopez, discovered gold in San Feliciano Canyon - and the California gold rush was on! It is ironic that Mexican (as well as Asian) citizens were permitted to work the mines, but were excluded from ownership.

In the railroad industry, the Chinese and Irish, in large part, did the backbreaking work that built the lines; however, Mexican labor also played a key role. Testimony to this fact are the Mexican-American communities along the railroad centers in the Midwest and throughout the West.

Significant also are the Latino contributions to the food industry of this country and, indeed, the entire world. Indigenous type tamale and chile dishes, caramel custard, guacamole, jambalaya, gumbo chicken with rice, paella and tacos are increasingly part of our menus.

The American tobacco industry has also benefited from Hispanic contributions. In 1868, long before cigarettes were at all popular or acceptable, the American cigar industry got its impetus from Cuban refugees who brought their renowned cigar-making skills to the United States. One hundred years later it happened again with the arrival of new refugees.

In the Southwest, the United States extended its borders in 1848, bringing one million square miles of Mexican territory and thousands of its citizens. It acquired an established economy as well as traditions of the Indo-Hispano-Mexican culture. Thus today our legal system, primarily in the Southwest, is heavily influenced by Mexican civil law and Roman law. In addition to the influence of Mexican justice of the peace system in our Southwest, two concepts have impacted our system:

1. The concept of communal water rights (which is derived from the Valencian Court of Water Rights) is a system of water distribution - or shared rights - designed for the well-being of the entire community. This legal base has played a key role in the economic development of California and the Southwest.

2. The concept of community property - Despite the tradition of "machismo", the outstanding feature of this legal doctrine is the importance given to the wife as a partner in the wealth and holding of the family, especially income and properties. Interestingly, this concept is found neither in Roman nor in Anglo-Saxon law. It is of course influencing our national legal process with respect to the property rights of women.

In the field of architecture, we can readily see the influence of Mediterranean and Spanish style throughout the country, especially in certain exclusive residential areas. Many of us live in a "ranch house" and have "patios". The affluent can afford "cabanas."

American literature has not escaped Hispanic influences. Notable examples are the works of Washington Irving (Tales of the Alhambra) and Mark Twain. It is said that you must first know Cervantes to understand Twain, who was an admirer of the works of Cervantes. If you compare their respective masterpieces, you will see that both Tom Sawyer and Don Quixote are idealists, while Huckleberry Finn and Sancho Panza are the realists. Of the modern authors, Ernest Hemingway seems almost obsessed and certainly influenced by the Hispanic culture. His novels, The Sun Also Rises, Death in the Afternoon and For Whom the Bell Tolls, readily underscore this point. Hemingway's masterpiece, The Old Man and the Sea, about a Cuban fisherman pitted against his catch, is a unique insight into the Hispanic character.

Hispanic authors such as George Santayana and Carlos Castaneda have also made their influence felt here in the United States.

Our fine arts too have been heavily influenced. Whistler and John Singer Sargent were influenced by Velazquez. Our modern muralists have also been influenced by the Mexican muralists Rivera, Orozco and Siqueiros. Even the ordinary graffiti writer now thinks twice before challenging the work of the barrio muralists, a phenomenon moving eastward from the streets of Los Angeles. The New York art scene, particularly in the field of design, is experiencing strong influences from Puerto Rican artists. World renowned artists of the calibre of Dali and Picasso have brought about profound changes in the art form.

What would our modern music be without the guitar? True rock-and-roll music is a combination of western music (derived from ranchero music) and Black influences, heavily based on the guitar. What would popular music stations do without latin music? Apart from the Puerto Rican contributions of the Salsa and the Plena, there are of course the Rhumba, Mambo, Bolero, Tango and Merengue, to name a few. The ballet now has Edward Vilella and Fernando Bujones, who follow the successful Alicia Alonso. In opera, Placido Domingo and Faustino Diaz are equally well known.

The world of sports is usually impacted by each rising ethnic group. Hispanics tend to predominate in horseracing, soccer, baseball and boxing. There are two significant contributions in "non-traditional" sports that are noteworthy. After dominating competitive tennis for a number of years, Richard "Pancho" Gonzalez today is one of the leading strategists of modern tennis, along with Pancho Segura. One man, by the name of Lee Trevino, changed the stuffy image of golf, encouraging participation of the common person. Few have contributed to the sport of golf as much as Trevino.

The history of the Hispanic American soldier has been one of distinguished service. They have suffered casualties and fatalities in all wars since the American Revolution. They have served with honor and with valor. Thirty-nine Hispanics have been awarded Medals of Honor. At present, there are 30,631 Hispanics in the Army - 29,561 in the enlisted ranks, 898 officers and 172 warrant officers.

If I have sounded positive about the group, it is because I meant to be positive. I belong to this Hispanic group and share in my daily living the language, the customs and the pride of the heritage. I believe recognition of that heritage is amply deserved. Let us give this recognition not in a sense of isolation but with a sense of unity in

what this group and other groups have given to maintain the social, political and moral strength of this nation. The more we learn about each other, the greater understanding of other nations and other peoples will develop.

A BLURRED STATISTICAL PORTRAIT OF HISPANIC SCIENTISTS

Betty M. Vetter
Executive Director, Scientific Manpower Commission

Esta ponencia presenta datos sobre: 1) matriculación y retención hispánica en la educación superior; 2) matriculación hispánica en las especializaciones de ciencia natural y social a nivel de universidad y estudios de post-grado (también dividida de acuerdo al género); 3) títulos otorgados a los estudiantes hispánicos; y 4) la participación de los hispanos en la fuerza laboral científica y de ingeniería. Se presenta una análisis de la insuficiencia de la información existente y de los métodos de reunión de datos a continuación de la presentación estadística.

In 1979, Hispanics were 4.7% of the U.S. population sixteen years old and older. Within that Hispanic population, 59.2% are Mexican American or Chicano; 13.6% are Puerto Rican, 5.1% are Cuban and 19.1% are other Hispanic, having their origins in Spain or South America.

A higher proportion of Cuban and "other" Spanish origin Hispanics are employed in professional and technical jobs than is true among those of Mexican or Puerto Rican origin (Table 1). We do not know whether these ratios are also true among Hispanic scientists. However, it does not appear unreasonable to assume that they might be similar, since we know that as of March, 1979, among all persons 25 or older, only 3.9% of Americans of Mexican origin had completed four or more years of college, compared with 4.1% of Puerto Ricans, 12.0% of Cubans and 13.8% of the remaining Hispanic U.S. population (Table 2). The proportion of college graduates among Hispanic men (5.3%) is higher than among Hispanic women (4.7%) (Table 3).

Enrollments

From the annual survey of freshmen conducted by the Higher Education Research Institute, we learn that 2.2% of males and 2.3% of females among freshmen in the fall of 1979 are of Hispanic origin. These proportions are similar for the Chicano and Puerto Rican groups (Table 4). However, Hispanic students are somewhat more likely to withdraw from college during their first two years than are non-Hispanic students. Another study by the Higher Education Research Institute found that students of Mexican origin were 1.2% of freshman enrollment, but 2.7% of students who withdrew. Puerto Rican students were 1.0% of entrants and 1.7% of withdrawers (Table 5).

Further evidence of higher withdrawal rate is found in the Census studies of school enrollment. In 1976, 26.7% of Hispanic men and 26.9% of women age 18 and 19 were enrolled in college, compared with 36.7% of white non-Hispanic men and 37.5% of women in those age years. However, in the 20 and 21 age group, the proportion of the Hispanic population enrolled in college drops to 19.4% for men and 19.3% for women, with the Mexican American group dropping from 25.1% of men and 22.2% of women age 18 and 19 to 13.3% of men and 10.4% of women age 20 and 21. Among non-Hispanic whites, 32.9% of men and 30.1% of women are still enrolled at 20 and 21 (Table 6).

Hispanic students made up 4.8% of total college enrollment in 1978. The National Center for Education Statistics reports that a smaller proportion of Hispanics (41%) than of non-Hispanic whites graduate from high school, but that among high school graduates, a higher proportion of Hispanics (21.2%) than non-Hispanic whites (19.8%) enter college.

We have no longitudinal data on enrollment of Hispanic students by field, although some data were collected in both 1976 and 1978. While the data are not fully comparable, some increase seems apparent over the two year period. In Fall, 1978, Hispanics were 5.7% of full time undergraduate enrollments in the biological sciences, and 1.3% of graduate enrollments. Women constituted 49.4% of the Hispanic undergraduates, and 38.6% of Hispanic graduate students in the biosciences. In the physical sciences, Hispanic students were 2.5% of undergraduate and .8% of graduate enrollment, with women being 30.5% of Hispanic undergraduates and 19.1% of the graduate students (Table 7).

Hispanics constituted only 1.9% of full time graduate enrollment in science and engineering at doctorate granting institutions in the Fall of 1979, with the highest proportions in psychology (2.8%) and social sciences (2.7%). Hispanic students were only .9% of full time graduate enrollment in engineering (Table 8).

Degrees

Hispanic graduates are somewhat more likely than white, non-Hispanic graduates to major in the social sciences (16% vs. 12%) and in psychology (6% vs. 5%), but somewhat less likely to major in physical sciences (4% vs. 5%) and mathematics or computer science (1.5% vs. 4%) according to 1977 records of earned bachelor's degrees. In 1977, the latest year of available data for Hispanic graduates, Hispanics earned 2.1% of the science and engineering bachelor's degrees and 1.9% of the master's degrees. The highest concentration is in psychology and the social sciences (Table 9).

At the doctoral level, among 63,837 Ph.D.s awarded in science and engineering to U.S. citizens and permanent visa aliens between 1973 and 1976, Hispanics earned 494 (.77%). From 1977 to 1979, they earned 645 of the 61,780 awarded (1.04%). Thus, for the combined seven year period from 1973 through 1979, Hispanics earned .91% of all science and engineering Ph.D.s awarded to U.S. citizens and permanent visa non-citizens. Again, the highest concentrations are in psychology and the social sciences. Among the 494 doctorates earned by Hispanics in the 1973-76 period, 25.3% were awarded to U.S. Puerto Ricans and 74.7% to Mexican Americans. Data are not available with which to determine whether these same proportions held for the later three years (Table 10).

Science and Engineering Labor Force

In March 1979, 272,000 Hispanics were employed in professional and technical occupations, but within this group, only 153,000 (61.2% of men and 49.5% of women) had completed four or more years of college (Table 11). The number of scientists among the college graduates in this population is not known.

Hispanics are 5.6% of the U.S. population, but only 1.5% of faculty in higher education. Their proportion among science and engineering faculties is not known, but probably is still less.

In 1976, only 7.8% of Hispanic men and 5.2% of Hispanic women in the labor force had completed four or more years of college. This included 5.5% and 3.0% of Mexican American men and women; 3.6% and 4.1% of Puerto Rican men and women; and 15.6% and 9.8% of men and women of other Spanish origin (Table 12).

Among all science and engineering Ph.D.s in the U.S. in 1979, only .8% or approximately 2,600 are Hispanic, according to data obtained by the National Research Council in its biennial survey of the doctorate population (Table 13). We also have a little more information on the doctorate population in earlier years.

In 1975, among 884 Hispanic Ph.D.s employed in the U.S., 15.5% were foreign born (Table 14). This proportion may or may not hold true in 1979. Among native born Hispanic Ph.D. scientists and engineers in 1975, 67.3% were employed principally in educational institutions and 13.8% in business and industry. We do not know whether these proportions are similar in later years.

Statistically, almost nothing is known about Hispanic scientists in the labor force who have less than a Ph.D., since the biennial data on U.S. scientists and engineers reported by the National Science Foundation do not include a breakout for the Hispanic population.

The Office of Personnel Management provides information on federal employment of Hispanic scientists and engineers as of November 1978. At that time, Hispanic workers in the federal government constituted 1.0% of professionals employed in the physical sciences; 1.5% in engineering; 2.3% in the health and medical sciences; 1.4% in the social and behavioral sciences; 1.8% in mathematics and statistics; .8% in the agricultural and biological sciences; and 1.3% in computer sciences (Table 15). We have no comparable data for Hispanic scientists in industry or in academic institutions.

Our statistical profile of U.S. Hispanic scientists is far from complete. We have no data by which to determine how many Hispanic scientists are employed, nor their proportion among all scientists, except for the estimates within the doctorate population. Our degree data on Hispanics by field is limited to 1977 degrees at the bachelor's and master's levels. Enrollment data indicate an increasing proportion of Hispanics enrolled in college, but we lack the longitudinal data that might indicate whether the number entering the sciences is increasing at the same rate as total undergraduate enrollment. We do know that a significantly higher proportion of Hispanic college students than of non-Hispanic whites enroll in two year institutions, which might indicate faster growth in non-science than in science areas.

We know almost nothing about the makeup of the various Hispanic groups within the sciences, nor do the data generally provide breakouts by sex, and especially by sex and field within the Hispanic population. While a higher proportion of Hispanics of Cuban and South American origin than of Mexican or Puerto Rican origin have completed four or more years of college, we do not know whether similar ratios exist in the science population. Even where breakouts of the Hispanic populations are available, we can rarely distinguish mainland Puerto Ricans from those living on the island of Puerto Rico. Thus, our statistical portrait is blurred even in its outlines, and almost void of detailed features.

We can say with assurance that no segment of the Hispanic population is represented in science or in the education pipeline leading to a science career in as large a proportion as it represents in the U.S. population. With somewhat less assurance, we can say that the situation seems to be improving.

There are many reasons why the data are deficient. Individuals answering questionnaires do not always indicate their Hispanic heritage. Most surveys are carried out on a sample of the population, and in these segments where the proportion of a group with a particular characteristic are as little as two or three percent, the statistical validity of each succeedingly smaller data cell becomes less. Thus, we cannot get even reliable estimates of a group such as Cuban origin biologists or female Mexican chemists. Nonetheless, until sufficient data are collected and reported to provide a reasonably reliable statistical reference base for a given time period, we have little with which to measure changes in participation or opportunity for Hispanics in science. The Hispanic population is said by some demographers to be the fastest growing segment of the U.S. population. If we are ever to achieve a clear picture of their progress in participation in science, we must have better data than are now available.

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TABLE 1

EMPLOYMENT STATUS AND MAJOR OCCUPATION GROUP OF THE TOTAL AND SPANISH-ORIGIN POPULATION 16 YEARS OLD AND OVER, BY TYPE OF SPANISH ORIGIN, MARCH, 1979

Employment status and occupation	Total population	Spanish origin					Not of Spanish origin[2]
		Total	Mexican	Puerto Rican	Cuban	Other Spanish[1]	
Persons, 16 years old and over.....(thousands)..	161,580	7,573	4,487	1,027	611	1,449	154,007
In civilian labor force.....(thousands)..	101,579	4,795	2,930	514	415	936	96,784
Percent unemployed.....	6.1	8.7	8.4	13.4	8.7	6.9	6.0
Employed.....(thousands)..	95,387	4,380	2,685	445	379	871	91,006
Percent.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers.....	16.1	7.6	5.8	9.1	10.8	11.0	16.5
Managers and administrators, except farm.....	10.9	5.5	5.1	4.4	6.1	7.0	11.2
Sales workers.....	6.3	4.0	3.1	3.4	6.7	6.2	6.4
Clerical and kindred workers.....	18.4	16.0	15.0	20.3	16.3	16.8	18.5
Craft and kindred workers.....	12.9	13.7	14.4	9.7	15.5	12.8	12.9
Operatives, including transport.....	15.0	25.4	25.8	26.3	28.5	22.2	14.5
Laborers, excluding farm.....	4.4	7.6	9.2	6.5	4.4	4.8	4.2
Farmers and farm managers.....	1.4	0.1	0.1	-	0.3	0.2	1.5
Farm laborers and supervisors.....	1.2	3.3	4.8	2.2	0.2	0.7	1.0
Service workers.....	13.5	16.7	16.7	18.2	11.2	18.2	13.4

- Represents zero or rounds to zero.

[1]Includes Central or South American origin and other Spanish origin.
[2]Includes persons who did not know or did not report on origin.

SOURCE: Persons of Spanish Origin in the United States: March 1979, Population Characteristics, Series P-20, No. 354, U.S. Dept. of Commerce, Bureau of Census

TABLE 2

PERCENT OF THE TOTAL AND SPANISH ORIGIN POPULATION 25 YEARS OLD AND OVER BY YEARS OF SCHOOL COMPLETED, TYPE OF SPANISH ORIGIN, AND AGE, FOR THE UNITED STATES: MARCH 1979

YEARS OF SCHOOL COMPLETED & AGE	Total Population	SPANISH ORIGIN					
		Total	Mexican	Puerto Rican	Cuban	Other Spanish[1]	Not of Spanish Origin[2]
PERCENT OF PERSONS WHO COMPLETED 4 YEARS OF HIGH SCHOOL OR MORE							
Total, 25 Years and over	67.7	42.0	34.9	38.6	50.4	60.8	68.9
25 to 29 Years	85.6	57.1	50.3	59.3	*	74.3	87.3
30 to 34 Years	83.8	51.0	42.8	45.0	*	79.8	85.6
35 to 44 Years	77.1	44.5	36.0	38.8	59.6	62.5	79.0
45 to 64 Years	63.9	33.5	25.3	26.3	44.5	54.6	65.0
65 Years and over	40.1	15.9	7.1	*	26.9	27.3	40.7
PERCENT OF PERSONS WHO COMPLETED 4 YEARS OF COLLEGE OR MORE							
Total, 25 Years and over	16.4	6.7	3.9	4.1	12.0	13.8	16.9

[1]Includes Central or South American Origin and other Spanish origin
[2]Includes persons who did not know or did not report on origin
* Base for the derived figure is less than 75,000

SOURCE: Educational Attainment in the United States: March 1979, Population Characteristics, Series P-20, No. 356, U.S. Dept. of Commerce, Bureau of Census

TABLE 3

PERCENT OF POPULATION 25-29 YEARS OF AGE WHO HAVE COMPLETED AT LEAST FOUR YEARS OF COLLEGE, BY ETHNICITY AND SEX, 1960, 1970, 1976 and 1979

	1960		1970		1976		1979	
	Men	Women	Men	Women	Men	Women	Men	Women
American Indian/ Alaskan Native	3	2	8	5	8	4		
Blacks	4	6	6	8	11	11	8.6	7.7
Mexican Americans	4	2	5	3	11	5	5.3	4.7
Puerto Ricans	4	1	4	3	6	4		
Japanese Americans	35	13	39	31	53	35	n.a.	n.a.
Chinese Americans	49	26	58	42	60	40	n.a.	n.a.
Filipino Americans	19	16	28	50	34	51	n.a.	n.a.
Majority	20	9	22	14	34	22	17.1	15.2

SOURCE: Social Indicators of Equality for Minorities and Women, U.S. Commission on Civil Rights, August 1978; and Population Characteristics, Series P-20, No. 356, Bureau of the Census

TABLE 4

RACIAL BACKGROUND OF FRESHMEN IN ALL INSTITUTIONS OF HIGHER EDUCATION, SELECTED YEARS, 1971-1979

RACIAL BACKGROUND	1971		1973		1975		1977		1979	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
White/Caucasian	92.1	90.6	89.1	87.9	87.2	85.6	87.9	86.0	87.2	85.4
Black/Negro/Afro-American	5.5	7.2	7.0	8.6	8.0	10.1	7.8	9.8	8.2	10.1
American Indian	1.0	0.9	0.8	1.0	0.9	0.8	0.8	0.7	1.0	1.0
Oriental	0.5	0.4	1.2	1.0	1.6	1.3	1.2	1.0	1.6	1.2
Mexican American/Chicano	1.1	1.1	1.3	1.2	1.8	1.6	1.4	1.4	1.1	1.2
Puerto Rican-American	0.2	0.2	0.5	0.4	0.7	0.6	0.9	1.0	1.1	1.0
Other	1.2	1.1	1.5	1.5	2.1	1.7	1.9	1.6	2.2	1.8

SOURCE: National Norms for Entering College Freshmen, Series 1966-1979, American Council on Education and Higher Education Research Institute

TABLE 5

STUDENT PERSISTENCE PATTERNS TWO YEARS AFTER COLLEGE ENTRY

(in percentages)

Characteristics	Total	Full-time Persisters	Erratic Persisters	Withdrawals
Sex				
Men	53.1	54.3	52.4	50.1
Women	46.9	45.7	47.6	49.9
Race				
White	87.9	89.0	86.8	84.9
Black	8.1	7.6	8.9	8.9
American Indian	0.7	0.7	0.5	1.0
Asian	1.1	1.1	1.6	0.8
Mexican American	1.2	0.7	1.3	2.7
Puerto Rican	1.0	0.8	1.0	1.7
Financial Aid				
Have Aid 1975-76	58.3	58.5	52.6	62.9
Have Aid 1976-77	56.5	56.4	48.8	66.8

SOURCE: Unpublished Study by Helen S. Astin, Higher Education Research Institute

TABLE 6

COLLEGE ENROLLMENT AS A PROPORTION OF TOTAL POPULATION BY AGE GROUP AND RACE, 1970 AND 1974; BY AGE GROUP RACE, SEX AND HISPANIC ORIGIN, 1976

	1970		1974		1976											
	WHITE	BLACK	WHITE	BLACK	WHITE			BLACK			SPANISH ORIGIN			MEXICAN ORIGIN		
					Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
16-17	3.5	2.1	3.8	3.0	3.3	2.4	4.2	2.9	1.9	3.8	2.5	1.3	3.6	3.1	2.3	3.8
18-19	39.3	21.8	34.4	23.2	37.1	36.7	37.5	28.6	24.2	32.6	26.8	26.7	26.9	23.4	25.1	22.2
20-21	31.9	19.9	30.1	21.3	31.5	32.9	30.1	24.9	24.8	25.0	19.3	19.4	19.3	11.8	13.3	10.4
22-24	15.1	7.0	14.9	11.0	16.8	20.2	13.6	15.5	17.7	13.9	14.2	17.3	12.1	8.6	6.4	10.2
25-29	7.2	3.8	9.4	8.3	9.7	12.7	6.8	9.3	11.0	7.9	7.1	10.4	4.2	5.0	7.9	2.0
30-34	3.8	2.6	5.3	6.3	5.4	6.3	4.6	7.4	8.8	6.3	3.8	5.6	2.4	3.5	5.4	1.8
Total All 16-34 yrs.	14.1	8.3	14.2	11.2	13.4	16.4	13.6	13.6	13.8	13.5	10.9	12.5	9.6	8.3	9.4	7.3

SOURCE: Fall Enrollment in Higher Education, 1978, National Center for Education Statistics

TABLE 7

FULL-TIME ENROLLMENT IN SELECTED FIELDS BY SEX AND ETHNICITY, FALL 1978

Undergraduate	Total Enrollment		Agriculture/ Nat. Resources		Biological Sciences		Business & Management		Physical Sciences	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
All Students	5,906,852	2,876,562	114,459	34,147	218,793	97,653	898,512	345,560	104,161	26,429
White	4,730,893	2,274,352	105,711	31,976	178,063	76,934	720,446	260,573	90,389	22,049
Black	601,967	342,583	2,337	859	16,717	9,697	95,449	49,713	5,077	2,088
Asian	116,000	53,756	1,232	472	6,066	2,768	13,245	6,259	2,249	684
Am. Indian	36,250	18,791	599	168	935	429	3,910	1,832	362	107
Hispanic	291,643	150,756	2,350	547	12,454	6,148	47,365	22,024	2,581	786
Non-Res. Alien	130,089	36,312	2,229	315	4,558	1,677	18,097	5,159	3,503	715
Graduate										
All Students	426,492	171,078	11,392	2,404	26,644	9,034	57,048	14,200	24,721	4,004
White	351,638	139,477	8,170	1,939	22,487	7,567	44,420	11,397	18,961	3,019
Black	20,989	11,633	171	34	557	293	2,396	865	364	106
Asian	9,279	3,572	227	64	772	285	1,370	413	606	148
Am. Indian	1,541	678	36	9	58	18	153	46	44	8
Hispanic	9,838	4,549	137	21	334	129	888	224	204	39
Non-Res. Alien	53,107	11,069	2,561	337	2,436	742	7,821	1,255	4,542	684
PERCENTS	% of Total	% Women	% of Total	% Women	% of Total	% Women	% of Total	% Women	% of Total	% Women
Undergraduate	100.0	48.7	100.0	29.8	100.0	44.6	100.0	38.5	100.0	25.4
White	80.1	48.1	92.4	30.2	81.4	43.2	80.2	36.2	86.8	24.4
Black	10.2	56.9	2.0	28.6	7.6	58.0	10.6	52.1	4.9	41.1
Asian	2.0	46.4	1.1	38.3	2.8	45.6	1.5	47.3	2.2	30.4
Hispanic	4.9	51.7	2.1	23.3	5.7	49.4	5.3	46.5	2.5	30.5
Am. Indian	0.6	51.8	0.5	28.0	0.4	45.9	0.4	46.9	0.3	29.6
Non-Res. Alien	2.2	27.9	1.9	14.1	2.1	36.6	2.0	28.5	3.4	20.4
Graduate	100.0	40.1	100.0	21.1	100.0	33.9	100.0	24.9	100.0	16.2
White	77.8	42.1	71.7	23.7	84.4	33.6	77.9	25.7	76.7	15.9
Black	4.9	55.4	1.5	19.9	2.1	52.6	4.2	36.1	1.5	29.1
Asian	2.2	38.5	2.0	28.2	2.9	36.9	2.4	30.1	2.5	24.4
Hispanic	2.3	46.2	1.2	15.3	1.3	38.6	1.6	25.2	0.8	19.1
Am. Indian	0.4	44.0	0.3	25.0	0.2	31.0	0.3	30.1	0.2	18.2
Non-Res. Alien	12.5	20.8	22.5	13.2	9.1	30.5	13.7	16.0	18.4	15.1

SOURCE: School Enrollment, October 1970, 1974 and 1976, Population Characteristics, Series P-20, No. 319, February 1978, Bureau of the Census

TABLE 8

FULL-TIME GRADUATE ENROLLMENT IN DOCTORATE INSTITUTIONS BY RACE/ETHNICITY, 1979*

(Percent Distribution)

	Total	Black°	Am. Indian Alaskan	Asian/Pac. Islands	Hispanic	White°	Foreign
TOTAL, ALL FIELDS	100.0	2.7	.2	1.8	1.9	74.0	19.5
ENGINEERING	100.0	1.1		2.2	.9	52.7	43.0
PHYSICAL SCIENCES	100.0	1.3	.1	2.0	1.6	70.8	24.2
ENVIRONMENTAL SCIENCES	100.0	.7	.1	1.1	1.3	83.5	13.4
MATH/COMPUTER SCIENCES	100.0	1.5	.1	1.9	1.4	65.0	30.2
LIFE SCIENCES	100.0	2.1	.2	2.0	1.8	81.8	12.2
AGRICULTURAL	100.0	.9	.1	.7	1.2	75.4	21.6
BIOLOGICAL	100.0	1.3	.1	2.3	1.6	83.3	11.4
HEALTH	100.0	3.9	.4	2.1	2.3	82.6	8.7
PSYCHOLOGY	100.0	4.1	.2	1.6	2.8	88.2	3.0
SOCIAL SCIENCES	100.0	5.4	.4	1.3	2.7	73.3	16.9

* In 3,953 responding departments °Non-Hispanic

SOURCE: National Science Foundation, Unpublished Data

TABLE 9

HISPANICS EARNING BACHELOR'S AND MASTER'S DEGREES IN SCIENCE AND ENGINEERING, 1976-77

FIELD	BACHELOR'S			MASTER'S		
	TOTAL	HISPANIC	% HISPANIC	TOTAL	HISPANIC	% HISPANIC
AGRICULTURE/NAT. RES.	21,467	164	.8	3,724	56	1.5
BIOLOGICAL SCIENCES	53,516	981	1.8	7,114	74	1.0
COMPUTER SCIENCES	6,370	93	1.5	2,724	46	1.7
ENGINEERING	48,548	887	1.8	15,869	245	1.5
MATHEMATICS/STATISTICS	14,086	221	1.6	3,695	42	1.1
PHYSICAL SCIENCES	22,187	332	1.5	5,282	55	1.0
PSYCHOLOGY	47,269	1,201	2.5	8,301	309	3.7
SOCIAL SCIENCES	116,802	3,026	2.6	15,458	340	2.2
TOTAL	330,245	6,905	2.1	62,167	1,167	1.9

Data Source: National Center for Education Statistics

TABLE 10

PH.D.'s AWARDED TO HISPANICS WHO ARE CITIZENS OR HOLD PERMANENT VISAS, 1973-1979

FIELD	1973-1976				1977-1979	
	MEXICAN		PUERTO RICAN		ALL HISPANIC	
	NUMBER	PERCENT OF TOTAL	NUMBER	PERCENT OF TOTAL	NUMBER	PERCENT OF TOTAL
PHYSICS/ASTRONOMY	22	.6	5	.1	35	1.3
CHEMISTRY	35	.6	6	.1	52	1.3
MATHEMATICS/STATISTICS	21	.6	6	.1	25	1.2
ENGINEERING	34	.4	17	.2	78	1.6
BIOLOGICAL SCIENCES	84	.8	17	.2	87	1.0
AGRICULTURAL SCIENCES	13	.5	5	.2	25	1.3
MEDICAL SCIENCES	9	.5	16	.9	16	.9
ENVIRONMENTAL SCIENCES	1	.3	4	1.0	23	1.4
PSYCHOLOGY	86	.7	21	.2	139	1.7
SOCIAL SCIENCES	64	.7	29	.3	165	1.9
TOTAL	369	.6	125	.2	645	1.1

Data Source: National Academy of Sciences

TABLE 11

PERCENT OF PROFESSIONAL, TECHNICAL AND MANAGERIAL WORKERS WITH COLLEGE TRAINING, MARCH, 1979

(Numbers in thousands)	WHITE						BLACK						HISPANIC*					
			Percent with College						Percent with College						Percent with College			
OCCUPATION GROUP	Total	No.	1 - 3 yrs.		4 or more yrs.		Total	No.	1 - 3 yrs.		4 or more yrs.		Total	No.	1 - 3 yrs.		4 or more yrs.	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
ALL OCCUPATIONS	38,210	25,235	43.1	35.8	25.3	18.5	3,429	3,300	25.3	29.0	11.1	12.1	1,963	1,187	21.3	20.6	9.3	8.3
Professional/Tech	7,001	4,830	87.5	82.7	71.6	63.5	338	483	79.2	79.8	53.5	59.2	169	102	80.7	74.6	61.2	49.5
Manager/Admin.	6,724	1,962	58.8	45.9	36.4	24.0	238	111	63.4	57.3	38.9	31.1	154	53	38.6	-	19.8	-

SOURCE: Educational Attainment in the United States: March 1979, Population Characteristics, Series P-20, No. 356, Bureau of the Census

TABLE 12

YEARS OF SCHOOL COMPLETED BY LABOR FORCE PARTICIPANTS, BY SEX, AND SPANISH ORIGIN AND RACE, MARCH 1976

Sex and years of school	All persons	Spanish origin				Black	White
		Total	Mexican American	Puerto Rican	Other		
Both sexes:							
Labor force (thousands)	93,063	3,936	2,393	473	1,070	9,079	82,450
Labor force (percent)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
8 years of elementary school or less	10.7	31.5	36.6	31.5	20.0	18.9	9.8
1 to 3 years of high school	17.1	19.7	21.1	23.5	15.0	24.3	16.4
4 years of high school	39.8	30.9	28.0	33.4	36.3	36.8	40.3
1 to 3 years of college	16.0	11.1	9.7	7.8	15.6	12.0	16.4
4 years of college or more	16.5	6.8	4.6	3.8	13.1	8.1	17.2
Men:							
Labor force (thousands)	55,246	2,420	1,517	301	601	4,702	49,651
Labor force (percent)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
8 years of elementary school or less	12.2	33.9	39.5	33.8	20.0	23.3	11.2
1 to 3 years of high school	17.1	20.5	20.7	26.5	17.0	24.7	16.4
4 years of high school	36.5	27.1	24.8	28.8	32.1	34.0	36.8
1 to 3 years of college	16.0	10.7	9.6	7.3	15.3	11.3	16.5
4 years of college or more	18.2	7.8	5.5	3.6	15.6	6.7	19.0
Women:							
Labor force (thousands)	37,817	1,516	876	171	468	4,377	32,799
Labor force (percent)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
8 years of elementary school or less	8.4	27.6	31.5	27.5	20.1	14.1	7.6
1 to 3 years of high school	17.1	18.6	21.9	18.1	12.6	23.8	16.3
4 years of high school	44.6	37.0	33.6	42.1	41.5	39.8	45.4
1 to 3 years of college	15.9	11.6	9.9	8.2	16.0	12.6	16.3
4 years of college or more	14.0	5.2	3.0	4.1	9.8	9.7	14.3

SOURCE: Workers of Spanish Origin: A Chartbook, U. S. Dept. of Labor Bureau of Labor Statistics, Bulletin 1970, 1978.

TABLE 13

SEX AND RACE OF U.S. SCIENCE AND ENGINEERING DOCTORATES IN 1979, BY FIELD

		Field of Doctorate										
	All Fields	Math	Comp	Phys/ Astrn	Chem	Envir	Engr	Agric	Med	Biol	Psych	SocSc
Total Population (1)	324,300	17,000	1,800	27,700	46,600	10,400	48,600	14,800	9,000	58,900	39,700	49,800
Sex												
Male	88.8	92.1	93.3	97.1	93.3	95.4	99.2	97.2	84.2	82.3	74.3	84.4
Female	11.2	7.9	6.7	2.9	6.7	4.6	0.8	2.8	15.8	17.7	25.7	15.6
Racial/Ethnic Group												
White/Caucasian	87.6	86.7	85.7	87.7	88.8	93.1	80.5	87.9	85.5	89.3	91.8	89.3
Minority Group	7.4	8.2	11.3	7.4	8.8	4.5	16.5	8.9	11.2	7.9	4.0	7.3
Hispanic	0.8	0.8	1.1	0.5	0.7	0.5	0.6	1.0	1.4	0.8	1.0	0.8
Black	1.1	1.0	*	0.7	0.8	0.2	0.3	0.9	1.8	1.2	1.5	2.0
Asian	6.6	6.0	9.3	5.9	7.0	3.6	15.5	6.5	7.9	5.7	1.1	4.0
Amer. Indian	0.3	0.4	0.9	0.3	0.3	0.2	0.1	0.4	0.1	0.2	0.4	0.5
No Report	3.4	5.1	3.0	4.9	2.5	2.3	3.0	3.3	3.3	2.8	4.2	3.4

SOURCE: Science, Engineering and Humanities Doctorates in the United States, 1979, National Research Council, 1980

TABLE 14

NUMBER AND PERCENT OF NATIVE BORN(N-B) AND FOREIGN BORN (F-B) U.S. DOCTORAL SCIENTISTS AND ENGINEERS BY EMPLOYMENT SECTOR AND RACIAL/ETHNIC GROUP,1975

RACIAL/ETHNIC GROUP		EMPLOYMENT SECTOR											
		Educational Institutions		Federal Government		Business & Industry		All Other		Employment Not Reported		Total	
		N-B	F-B	N-B	F-B	N-B	F-B	N-B	F-B	N-B	F-B	N-B	F-B
White	No.	121,278	9,438	16,139	1,336	51,075	4,670	19,146	1,441	12,010	1,364	219,648	18,249
	%	55.2	51.7	7.3	7.3	23.3	25.6	8.7	7.9	5.5	7.5	100.0	100.0
Black	No.	1,448	74	212	-	340	7	195	-	121	2	2,316	83
	%	62.5	89.2	9.2	-	14.7	8.4	8.4	-	5.2	2.4	100.0	100.0
American Indian	No.	263	9	24	-	79	-	59	-	15	-	440	9
	%	59.8	100.0	5.5	-	18.0	-	13.4	-	3.4	-	100.1	100.0
Hispanic	No.	503	74	35	23	103	21	83	19	23	-	747	137
	%	67.3	54.0	4.7	16.8	13.8	15.3	11.1	13.9	3.1	-	100.0	100.0
Asian	No.	776	2,955	108	427	387	1,966	146	390	19	169	1,436	5,907
	%	54.0	50.0	7.5	7.2	26.9	33.3	10.2	6.6	1.3	2.9	99.9	100.0
Total Reported	No.	124,268	12,550	16,518	1,786	51,984	6,664	19,629	1,850	12,188	1,535	224,587	24,385
	%	55.3	51.5	7.4	7.3	23.1	27.3	8.7	7.6	5.4	6.3	99.9	100.0
Other & Unknown	No.	5,180	675	602	96	1,696	286	820	91	932	96	9,230	1,244
	%	56.1	54.3	6.5	7.7	18.4	23.0	8.9	7.3	10.1	7.7	100.0	100.0

SOURCE: Women and Minority Ph.D.'s in the 1970's: A Data Book, National Research Council, 1977

TABLE 15

HISPANICS AMONG FEDERAL PROFESSIONALS, NOVEMBER 30, 1978

OCCUPATIONAL FIELD	TOTAL NUMBER	HISPANIC	% HISPANIC
PHYSICAL SCIENCES	30,602	322	1.0
ENGINEERING	89,045	1,371	1.5
BIOLOGICAL & AGRICULTURAL SCIENCES	24,852	202	.8
MATHEMATICS AND STATISTICS	7,777	140	1.8
COMPUTER SCIENCES	235	3	1.3
HEALTH AND MEDICAL SCIENCES	58,610	1,323	2.3
SOCIAL & BEHAVIORAL SCIENCES	18,389	258	1.4
TOTAL	229,510	3,619	1.6

SOURCE: Equal Employment Opportunity Statistics, Office of Personnel Management, 1980

THE EDUCATION OF PUERTO RICANS IN THE UNITED STATES

Shirley Mahaley Malcom
Program Head, Office of Opportunities in Science
American Association for the Advancement of Science

Esta ponencia muestra y analiza la tasa de deserción en todos los niveles educacionales para los estudiantes portorriqueños en los Estados Unidos y su efecto en el ingreso de los mismos a las carreras científicas. Se presentan las posibles razones para la alta tasa de deserciones de estudiantes portorriqueños en términos de las barreras especiales que deben enfrentar a nivel pre-universitario, universitario, estudios de post-grado y profesional. Por último, se describe brevemente la necesidad de la programación y actividades auspiciadas por NIH utilizando dramatización de modelos junto con asistencia financiera.

In a 1976 evaluation report to the National Science Foundation, Joel Aronson made the following observations about the education of minority students:

- The reasons for the attrition of Black students from the educational pipeline are not clearcut since Blacks show enrollment and retention patterns which, though lower, are similar to those for white students.

- The education flow pattern for Mexican American students indicates a lower high school completion rate than for white students and a lower rate of entrance into higher education with a disproportionate percentage of Mexican American students entering two-year institutions.

- Many Native American students drop out of the educational pipeline in elementary school.

SOME MILESTONES IN EDUCATION FLOW*

Ethnic Group	Enroll First Grade	Complete Grade Ten	Complete High School	Enter Higher Learning
	PERCENT OF ORIGINAL ENTRANTS			
Anglo	100%	98%	85%	42%
American Indian	100%	85%	60%	25%
Black	100%	97%	75%	36%
Mexican American	100%	91%	60%	23%
Puerto Rican	100%	93%	42%	16%

- One hundred Anglo students and one hundred Puerto Rican students who enter the first grade show completely different patterns of participation as they approach certain milestones within the educatonal process; ninety-three of the Puerto Rican students and ninety-eight of the Anglo students remain in school at the completion of the tenth grade but by high school graduation, eighty-five of the Anglo students and only forty-two of the Puerto Rican students remain. Forty-two of the original 100 Anglo students enter higher education but of the Puerto Rican students there are only sixteen. (Aronson draws heavily on the work of Valdivieso in constructing the educational picture for Puerto Ricans.) The little information that is available to us as to the fate of this 16% beyond their entrance into higher education is sketchy. We do know that their entrance into two-year and four-year institutions is at rates that are proportionately similar to those of Anglo students. Beyond that we have little idea as to what happens to the Puerto Rican students. We surmise that few enter science, since degree data show tremendous underrepresentation in such careers.

A primary element of our puzzlement over the fate of these students is a lack of data. Aronson notes the difficulty in assessing the nature of the educational problem in the absence of statistical studies where Puerto Ricans, as a separate group, are identified, tracked and their educatonal barriers and needs determined. Using the

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*Derived from Joel B. Aronson. An Analysis of Supported Projects to Test Methods for Increasing the Access of Ethnic Minority Students to Careers in Science and Technology, Volume II, Technical Report. Washington, D.C.: American Institutes for Research, November 1976.

available information on Puerto Rican students, one can easily conclude that these students cannot be directed into science if they are not in school. It is also simplistic to note that nothing that we know about the way these students are trained is supportive of the entrance of Puerto Rican students in large numbers into quantitatively-based careers. One very important factor is that relatively large numbers of Puerto Rican students who are in school are behind age-grade. Another interesting point is the appearance of stop-out, that is, the large number of students who are out of high school for a year or more before enrolling in a school of higher education and the number of students who attend some college, drop out or stop out and then eventually return to finish their baccalaureate degrees. In order to assess the potential within a Puerto Rican student population for careers in science and biomedicine, it is necessary to look at the barriers which face these students throughout their educational experience. Why do so many Puerto Rican students disappear from the school population prior to high school graduation? What events earlier in the educational experience of these students lead them to drop out? In the discussion of special barriers which follows, it should be noted that many of these apply generally to all Hispanics and others generally to all minorities.

Pre-College

As indicated previously, the Puerto Rican student who enters the first grade has less than a fifty-fifty chance of completing high school. With such odds, one must look critically at the educational system that would foster such low chances for completing a high school education. When looking at the specific barriers to Puerto Rican participation in science, researchers indicate a number of factors including the lack of skill in English that would allow a student to successfully compete in a classroom setting in which English speaking/reading/writing is required. The movement of Puerto Rican populations back and forth between the Island and the mainland, i.e., between a predominant Spanish and a predominant English speaking cultural setting, makes it difficult for those without strong bilingual English-Spanish preparation to compete in school settings which demand that he or she be alternatively proficient in both languages. Other problems which have been noted at the pre-college level include (1) student tracking in non-academically based general, vocational or even special education programs; (2) teacher expectations which do not include the possibility of strong academic career choices for Puerto Rican students; (3) lack of continuity in the classroom setting due to in and out, back and forth migration for a number of Puerto Rican students; (4) cultural values or traditions which do not support the choice of a science-oriented or quantitatively-based field; (5) peer pressure not to study; (6) inappropriate use of tests that result in labelling of non-English proficient students as mentally retarded; (7) inadequate academic preparation in mathematics and science; and (8) lack of role models of Puerto Rican professionals. An entire educational and social setting tells these students that science and biomedical careers are not attainable for them, with this message being carried by the media, by the schools, and by significant others in the students' lives. Such expectations are self-fulfilling in that pre-college educational preparation necessary to achieve science or biomedical career goals is not even offered to the students. Financial hardships may then force all but the most resolute into a labor market for which they have little or no training and which already boasts a sky high rate of minority teenage unemployment.

With the regular school program dealing from a stacked deck for most of these students, one might think that out-of-school activities hold the key to increased participation or might at least be a possible mechanism for lessening the damage which seems to be done in the regular educational pipeline. Few science or biomedical

enrichment programs have been identified which are aimed at the problems faced by Puerto Rican students. In a 1976 publication, An Inventory of Programs in Science for Minority Students, Malcom, Cownie and Brown identified only one program in more than three hundred fifty listed that specifically sought to deal with barriers of Puerto Rican students to careers in medical fields; this was a project sponsored by ASPIRA. While programs for Puerto Rican students, in conjunction with other minority student populations (mostly Black) did exist, these were few in number, and most did not or could not address the particular language and cultural barriers faced by Puerto Rican students. The National Science Foundation-funded Resource Centers for Science and Engineering programs hold some potential for being able to address the pre-college educational programs in Atlanta, in the Southwest, and on the Island of Puerto Rico. Should such a Center as is described in the previous paper by Gomez be established in the Northeast to deal with mainland Puerto Rican populations, perhaps some model and demonstration projects specifically aimed at Puerto Rican students might be implemented there as well. Clearly, the need to work with local school systems in developing programs for Puerto Rican students must be addressed.

College Level

Evidence indicates that Puerto Rican students who get through high school enter college in patterns that are similar to the Anglo students. Data suggest the Puerto Rican students are typically older, more likely engaged in part-time or full-time study that includes employment, more likely returning to school after acquiring the obligations of a family or other responsibilities and more likely equipped with an inadequate educational background. With the need for remediation adding more time to the stay in college, financial burdens are more strongly felt. The promise that programs such as MBS and MARC hold for the talented, disadvantaged Puerto Rican student is evidenced by the examples of such students who have gone on to graduate careers. With the decrease in real support for these programs, one can only guess at the number of students who, though academically capable and deserving of support, will be denied the opportunity for assistance through these excellent programs.

The predominantly majority institutions at the large urban centers in New York and New Jersey are being called upon increasingly to provide innovative programming to assist Puerto Rican students in college to remain in college and to assist those with the potential to pursue a career in science to achieve that potential. The disadvantages faced by Puerto Rican students at the college level include: lack of role models among faculty at the institutions which these students attend, lack of peer support due to small numbers of Puerto Rican students in science curricula, lack of adequate financial assistance for these students, lack of opportunity for part-time study in science programs or study at hours which will allow simultaneous employment, and lack of part-time employment opportunities which are field related for students who are in science and biomedical career programs.

Graduate and Professional Level

Many of the barriers outlined for the college level continue through to the graduate and professional level. Few Puerto Rican students are aware of science and medical professionals who are themselves Puerto Rican, who can serve as models of what might be possible for them to attain. Few of these Puerto Rican students have access to systems of mentoring and counseling that will advise them on their progression through the career. Financial aid or the lack of financial aid continues to be a problem

but may be more so in the coming years with the elimination or the cutback of funds which have served as sources of support for those who would choose to go on in careers in science and biomedicine. Attitudes continue to be important barriers on both sides: the stereotype of the scientist usually does not include a Spanish accent; the stereotype of the Puerto Rican does not include a lab coat. Perhaps these stereotypes, these attitudes are the greatest barriers which must be overcome.

Implications for Programming and Activities by NIH

Role Models

Support production of (or produce) audio-visual presentations, brochures, etc. that show Puerto Rican biomedical professionals at work and Puerto Rican biomedical students. This could be done for "Hispanics" with prominent inclusion of Puerto Rican professionals and students. Any such program should be available in Spanish and English.

Support programs that bring Puerto Rican faculty into contact with Puerto Rican students. This may be done through programs that put Puerto Rican researchers into urban predominantly majority institutions that train significant numbers of Puerto Rican students. This may also be achieved by programs that allow Puerto Rican students to study or work for short periods (such as summer programs) with Puerto Rican researchers either on the mainland or the Island.

Financial Assistance

Advertise the availability of existing resources for financial support of Puerto Rican students.

Support programs that provide opportunities for Puerto Rican students to be employed in biomedical research projects so that employment and studies are mutually supportive.

Several of the program elements suggested above are already part of existing NIH efforts. In this case, the emphasis should be placed on better publicity for these programs among Puerto Rican students. Consideration should also be given to ways of supporting specific program elements independent of comprehensive grants. This strategy would permit support for minority students who are matriculating in institutions which are ineligible for existing targeted programs. Support for independent program elements must not, however, be a responsibility added to existing program goals unless funds are increased.

STATUS OF PUERTO RICANS IN SCIENCE - THE ISLAND

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Esta ponencia examina el estado de la educación científica y de la investigación en Puerto Rico. Se hace una comparación entre Puerto Rico y la parte continental, incluyendo factores demográficos y económicos por medio de un cuadro que describe el porcentaje de títulos de maestría otorgados en ciencia a las mujeres. Otros cuadros y gráficos documentan la necesidad de que haya más profesores que tengan doctorados en materias científicas en todas las instituciones y el crecimiento de la actividad científica y el financiamiento externo. Se describen problemas fundamentales en la preparación y capacitación en las materias científicas a nivel de escuela secundario y universitario, incluyendo un análisis de programas y actividades que ahora existen para preparar a los estudiantes en las carreras científicas, matemáticas y de ingeniería. Por último, se analiza la necesidad continua de financiamiento federal.

Most of the participants attending this first conference of Puerto Rican scientists have always resided or are presently residing on the mainland. Although a substantial number of them received part of their formal education at one of the institutions of higher learning in Puerto Rico, most are out of contact with the current state of scientific research and education on the island. It seems appropriate, therefore, to begin this report with a panoramic overview of similarities and differences between Puerto Rico and the mainland.

The contrast between the state of science in Puerto Rico and the mainland can best be dramatized by an anecdote. Two years ago, Dr. George Pimentel, then at the National Science Foundation, gave a talk in Puerto Rico that started with a review on the status of American science. Going on the assumption that within relatively small variations, the general trend would be the same in Puerto Rico, he proceeded to point out and expound on the main problems affecting science education and research, particularly with regard to its academic component. Well known problems were analyzed, such as: (i) decreasing funds for research; (ii) stagnant faculties; (iii) decreasing enrollment in the sciences at the undergraduate and graduate levels; and (iv) surplus of Ph.D.s in the academic market. We surprised him by quoting from the recently completed study on Puerto Rican science that served as the basis for the successful proposal that obtained for Puerto Rico the third national Resource Center for Science and Engineering. The statistics and analysis of the study clearly showed that the trend in Puerto Rico of the four factors just mentioned was contrary to that of the mainland. Let me share with you some of the statistical results that exemplify these differences.

The most outstanding evidence of the phenomenal expansion of higher education on the Island is the doubling in enrollment at accredited institutions during the last decade, going from 60,000 students in 1968 to 119,000 in 1979. About 18% of the student body is studying towards a bachelor in science or a science-related degree. A similar situation is found for the enrollment at the graduate level. For example, the College of Natural Sciences, which has more than half of the science graduate students on the Island, has doubled its graduate enrollment in the last six years, going from 90 graduate students in 1974 to more than 200 for this academic year. The increase in enrollment has stimulated the creation of new curricular options in the sciences, both

at the undergraduate and graduate levels, with private institutions concentrating on increasing their undergraduate facilities while the state-run University of Puerto Rico has opted to strengthen and diversify its graduate offering. As a result of this growth, the faculty in the majority of the academic institutions is young and dynamic. Faculty age medians in the early and mid-thirties are not uncommon. The shortage of well-trained Ph.D. Spanish-speaking or bilingual scientists interested in academic employment, coupled with the phenomenal expansion of higher learning in Puerto Rico, has forced, particularly in the private sector, the hiring of faculty that does not have the terminal degree. The following table illustrates this problem.

Table 1 - Distribution of Degrees Held by Professors of Science and Engineering at Institutions Participating in the Center

Institutions	Total No. of Professors	% Ph.D.	% M.A./M.S.	% Bach.
Rio Piedras	118	60	37	2
Mayaguez	247	46	46	6
Cayey	42	30	54	11
Humacao	55	12	85	1
U.P.R. Regional Colleges	120	5	74	18
Inter American	129	22	72	4
Catholic	65	12	61	24
Junior College	50	4	94	2
Sacred Heart	39	7	87	2

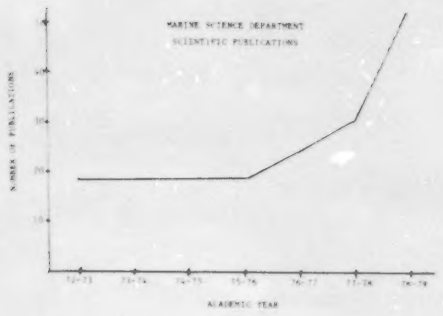
Cognizant of the problem faced by their institutions, the academic administrators have developed an extensive fellowship and training program designed to increase the number of Ph.D.s on their faculty, particularly in the sciences. Projections made by the administrators of the two-year and four-year colleges participating in the Resource Center indicate that these institutions will need to train or hire 163 Ph.D.s in the basic sciences during the 1980-85 five year period.

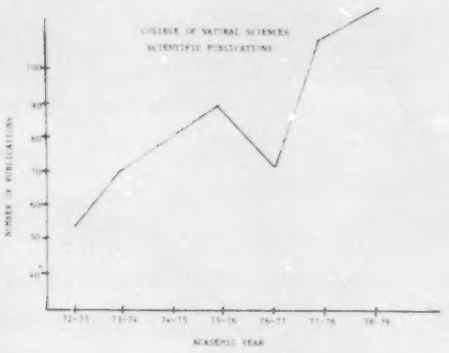
Table II - Resource Center Associated Universities Need for Ph.D.s by Field for the Period 80-85 (as Stated by Associated University Administrators)

	2-Year Institutions	4-Year Institutions	Total
Physics	7	18	25
Biology	14	39	53
Chemistry	8	27	35
Mathematics	14	36	50

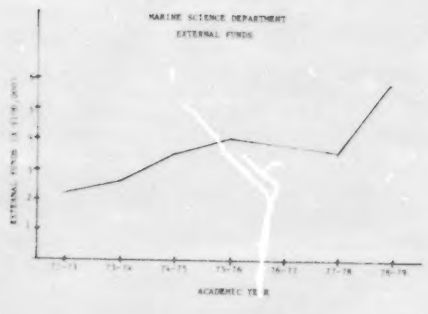
Academic research on the Island starting from a narrow base in the early seventies experienced a rapid rate of growth in the later part of the decade. This growth has been due in good measure to the increased availability of research funds for minority

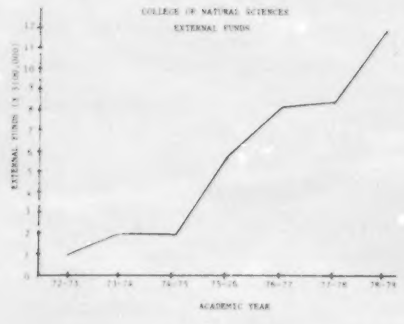
institutions and the larger pool of qualified graduate students available to co-participate in the research activity. Particularly worthy of notice as main contributors of funds and stimulus to the academic research programs in Puerto Rico are the MBS program of NIH, the Research Improvements in Minority Institutions (RIMI) program of NSF, the special Center for Energy and Environmental Research sponsored by the Department of Energy (DOE), and more recently, the NIH-MARC program, and the NSF-Resource Center project. The number of research papers published in refereed scientific journals by the faculty of science departments and research institutes on the Island surpassed the 200 mark in the 1979-80 academic year. The vitality of the research activity can be further ascertained by the response to the Resource Center sponsored Junior Technical Meeting that will bring together the scientific research community of the Island and will provide a forum before which the undergraduate and graduate students will present the results of their research work. For this year, 120 papers in the different fields of science have been accepted for presentation. The following graph illustrates the growth of scientific activity as measured by papers published by the College of Natural Sciences at UPR-Rio Piedras and the Marine Sciences department at UPR-Mayaguez, two of the most active research units on the Island.





This research activity correlates well with the increase in external funds, mostly from federal sources, for these two units, as illustrated by the following graphs.





The differences between the state of science in Puerto Rico and the mainland are due to two fundamental factors, one demographic and the other economic. While the end of the impact of the post-war baby-boom in the United States has dried up the source of potential college students, forcing colleges and universities to retrench and look for new sources of students, Puerto Rico's increasing population provides a steady pool of potential students that keeps up an unrelenting demand for higher education opportunities. This pressure is augmented by the prevailing conviction of the typical Puerto Rican father that a university degree is the key to the economic upward mobility of his offspring, even in the face of mounting evidence that technical skills obtained in two-year programs are in many instances better paid by the local labor market than those requiring a college degree. The change of Puerto Rico from a mainly agrarian society to a rapidly growing industrial center during the past twenty years has provided a steadily increasing demand for highly trained engineers and scientists, this being particularly so in the case of chemistry and computer related disciplines. In recent years, moreover, the dominant labor intensive manufacturing sectors have been giving way to highly technical capital intensive industry, mainly pharmaceuticals, petrochemicals and electronics, that require large numbers of highly skilled technical personnel. These demands by industry, together with the faculty needs of the expanding higher education system, have sustained a favorable market for students trained in science and engineering at the bachelor and master levels and, more recently, as the industrial and educational sectors have increased in complexity and sophistication, at the Ph.D. level.

I would not like to pass on to other considerations without first pointing out another area of considerable contrast between science in Puerto Rico and the mainland that exists in relation to the issue of underrepresentation of women in science. With the exception of physics, the presence of Puerto Rican women in the basic sciences is fast approaching parity with men and, in the case of mathematics, it has reached overrepresentation levels, as measured by the number of master degrees granted by the University of Puerto Rico in this field. The following table illustrates the marked differences that exist between the continental United States and Puerto Rico.

Table III - Percentage of Master Degrees Awarded to Women in Science

	Physics	Mathematics	Chemistry	Biological Science
Continental United States	9%	14.5%	23.9%	31.7%
Puerto Rico	19%	68%	40%	49%

So far we have described what seems to be a very positive picture of what is going on in Puerto Rico, particularly at the college and university levels. Let us now look at some of the more fundamental problems that are hindering the further development of science on the Island. The weakest link in the educational chain in Puerto Rico is at the pre-college level, a problem which we share with the Puerto Rican community that resides in the continental United States. The problem is particularly acute in the disciplines of science and mathematics, where colleges and universities have failed to train science and mathematics teachers in sufficient numbers, and of the quality needed by our public and private educational systems. It is the

norm rather than the exception to find a teacher with training in biology teaching high school physics, or one with a background in home economics teaching chemistry. Those few teachers who are properly trained in the sciences tend to get discouraged by low salaries and very difficult working conditions and eventually leave their teaching for better paying jobs. As a result of the poor background in science and mathematics that the majority of high school graduates bring with them when they enter college, it becomes necessary for these colleges to create a large number of remedial courses, at considerable expense of money and faculty time, to correct their deficiencies.

In an effort to lower costs and at the same time increase the efficiency of the remedial courses and other basic skills development activities, several Island colleges and universities have implemented state-of-the-art educational technology. This is particularly true of the College of Sciences at UPR-Rio Piedras where a group of highly motivated faculty have pioneered in the use of TV and computers as educational resources in Puerto Rico. Its introductory pre-college mathematics TV course, the Computer Assisted Instruction (CAI) modules developed for introductory physics, chemistry and biology, the well structured basic programming course, and its Personalized System of Instruction (PSI) for introductory chemistry, have all been highly successful and have played a major role in helping freshmen and sophomores develop basic mathematical and scientific skills. The developmental funds that made possible the introduction of this modern educational technology were provided by NSF through its Minority Institutions Science Improvement Program (MISIP) and Comprehensive Assistance to Undergraduate Science Education (CAUSE) programs, and the Department of Education Fund for the Improvement of Post-Secondary Education (FIPSE) program.

On the undergraduate level, at both the Rio Piedras and Mayaguez Campuses, where the four Ph.D. programs in the sciences reside, the faculty is adequately staffed and properly trained. In the sciences, both institutions receive the most qualified high school graduates available on the Island and provide them with excellent opportunities to develop their potential as scientists through special activities such as undergraduate research projects. The College of Natural Sciences at Rio Piedras has the largest undergraduate research program on the Island, with over 180 students participating per semester. This undergraduate research is partially financed by NIH's MBS and MARC programs. The same cannot be said about the remaining undergraduate science and mathematics programs on the Island, where over 75% of the college level science students are enrolled. Although there is a marked variation in the level of development of these institutions, and several have excellent science programs, they all have three basic problems in common: (i) inadequately trained staff; (ii) overworked faculties; and (iii) student bodies with deficient science and mathematics background.

An in-depth study of science education and research in Puerto Rico, sponsored by the NSF through its Graduate Centers Planning Grant program, contains a more detailed analysis of the strengths and weaknesses of science in Puerto Rico that we have highlighted here. This study was the base upon which the Resource Center for Science and Engineering of Puerto Rico was conceived and structured.

The Resource Center's overriding goal is to increase the number and quality of talented Puerto Rican students who initiate and successfully complete a higher degree in science, mathematics or engineering and then, hopefully, go on to productive careers in one of the sciences or in engineering. As its central strategy, the Resource Center was conceived as a consortium of the major institutions of higher educaton with active science and engineering programs on the Island, that would: (i) consolidate and integrate human and physical resources at the graduate and research levels; (ii) utilize low-cost high-yield activities to optimize existing strong academic infrastructures in the main

campuses that will serve as a resource for the developing ones; and (iii) identify talented students at the intermediate and high school levels and provide them with a variety of activities that will develop their scientific and mathematical skills.

Since the Center, as structured, is expected to cover all levels of scientific activity and promote concerted efforts to remedy some of the main problems affecting scientific development in Puerto Rico, we would like to end this report on science in Puerto Rico by briefly outlining some of its main projects. At the graduate level, the Center has established two new Ph.D. programs: an interdisciplinary Ph.D. in Chemical Physics that will help to optimize the resources of the physics and chemistry departments at the Rio Piedras campus and promote joint research projects, and an intercampus Ph.D. program in Biology that will foster joint activity between the faculty of the Biology Department at the Rio Piedras campus and the Basic Sciences Departments of the Medical Sciences campus. The Marine Sciences Ph.D. program at Mayaguez and the decade-old Ph.D. program in chemistry at the Rio Piedras campus will be strengthened. The recently initiated applied mathematics option of the master's degree of the Department of Mathematics in Rio Piedras will be developed through a "Mathematics Clinic" that will permit its graduate students to obtain practical experience with "real world" mathematics problems provided by industry and government. Resource Center funds for basic research equipment will be supplemented with competitive research grants to promote research activity of the Center's staff.

At the undergraduate level, the graduate programs staff and facilities will serve as a resource for those members of the consortium, known collectively as the Associated Universities, that lack graduate programs and extensive research facilities. Through its Ph.D. programs and other activities, the Center will provide special opportunities for the professional development of the staff of the Associated Universities, including the opportunity to obtain the terminal degree in one of the sciences. For those faculty members who already have a Ph.D., a special program of collaborative research with a member of one of the graduate programs has been implemented. For the most talented of the 75% of the undergraduate science students who are in one of the Associated Universities, several programs have been designed to enhance their opportunity for admission to a graduate program. These are: (i) opportunities for undergraduate research in one of the research facilities of the Center; (ii) advanced undergraduate courses during the summer; and (iii) a traveling lecture program that will take local researchers to the Associated Universities campuses. Since the main limiting factor in the development of our best scientific talent is at the pre-college level, the Center is devoting one third of its efforts and funds to students at this level. A large number of talented students are lost at the pre-college level because of lack of adequate career guidance in our high schools, and a resulting poor vocational definition of our students. To correct this deficiency, a multimedia career orientation program is being implemented utilizing radio, TV and a newsletter that is distributed in our secondary schools. A search is underway to identify a group of talented seventh and tenth graders who will be invited to attend a summer camp where they will perform a set of tasks and participate in activities especially designed to develop their scientific, mathematical and communications skills. Finally, a college head-start program will be implemented to bring talented high school graduates in the summer, prior to their admission to college, to provide them with advanced high school courses in mathematics and sciences that are presently taught only in our best high schools.

The growth and progress achieved in science education and research in Puerto Rico during the past six to eight years, as we have presented it here, would never have been possible without the developmental funds provided by the National Science Foundation, the National Institutes of Health and other federal agencies. Funds

earmarked for minority institutions have been especially helpful in establishing the necessary infrastructure that Puerto Rico needed to compete for mainstream grant funds. An abrupt termination of funding would certainly create havoc in science education and research in Puerto Rico and would probably mean that the progress already achieved would be undone. It is for these reasons that the academic community is apprehensive about the federal funding cuts being discussed in Washington and in particular about those that will affect science education.

PUERTO RICANS AND SCIENTIFIC ORGANIZING

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American Association for the Advancement of Science

La presente ponencia consiste de dos secciones. La primera examina los métodos por medio de los cuales los científicos (especialmente mujeres y minorías) se han organizado — camarillas, comisiones, asociación individual, sistema de contactos, y las oficinas y proyectos dentro de las organizaciones científicas. La segunda sección resume el sistema de contactos establecido durante la reunión de científicos portorriqueños en abril de 1981, como un primer paso hacia una asociación nacional separada propria.

In 1976, a group of Puerto Rican scientists meeting in New York emphasized the importance of organizing among themselves as a means to accomplish educational and professional goals. During the 1981 conference, Puerto Rican scientists again took up the matter. They reviewed the patterns of organization used by other groups underrepresented in science as outlined in Section I below. At the close of the 1981 meeting, they established regional networks and decided to meet again in Washington, D.C. in January 1982 to consider forming a national association. Section II below outlines progress on their regional network organizing.

I. Organizational Models*

Women and minority scientists have used at least five models of organizing to gain equity in science — the caucus, the committee, the separate association, the network, and offices or projects within scientific organizations. Of course, most groups are a mixture of the features mentioned below and do not conform to the ideal scheme outlined here. Also, titles may not reflect the nature of the group; for example, a committee may have "caucus" in its title but act as a committee.

Caucus. Caucuses are an informal style of organizing in which the group is not an official part of the larger association with which it is allied. Usually caucuses have a few officers to give continuity to the group. They meet with the larger organization whose practices they are trying to influence. They do not have funding from their "parent" group, but may collect a modest dues from each caucus member or take donations during their meetings. The caucus is free to speak for itself, but not for its related society.

The AAAS, for example, has a women scientists' caucus which meets during the AAAS Annual Meeting. It sponsors a social function at which a guest speaker addresses issues of concern to the group. Anyone can attend the social function, and those who do are the "members" of the caucus. The group collects money at the meeting to pay for its membership in a federation of women's groups. The caucus is best known for

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*This section of the essay owes much to discussions held with Janet Brown of the Environmental Defense Fund and Rayna Green of Dartmouth College.

its successful lobbying of the AAAS Board to hold national meetings only in states which had ratified the Equal Rights Amendment.

Committee. A committee is an official part of an organzation. Members of the committee may be elected or appointed by the governing board of the organization. The parent association funds its activities. Most committees are devised to advise the Board or Executive Officer of the society of some aspect of its work. A few committees issue newsletters or maintain rosters. None, to our knowledge, charges dues. Since the committee is formally connected to the larger group, it is more constrained than a caucus in its activities, especially when taking a public stand on controversial issues, which may require approval of other authorities in the association.

Committees are a popular form of organization with women scientists. The AAAS knows of over thirty committees of women scientists, but of less than a dozen committees of minority scientists. Sometimes a committee serves both groups, as in the Committee on Opportunities in Science of the AAAS.

Association. Scientists organize themselves in separate organizations for many purposes. The groups often devote themselves to one discipline or specialty. Many women and minority scientist groups reflect this specialization, such as the National Society of Black Physicists. Other groups cover all scientific disciplines, such as the Society for the Advancement of Chicanos and Native Americans in Science. An association is usually incorporated under state law, publishes a periodical (sometimes several), collects dues from its members, and runs meetings. Some groups have rigid requirements for membership; others are open to anyone who applies and pays dues.

The association model of organizing is important to minority scientists for historical reasons. Until the 1950s, scientific societies often met in cities with segregated hotels and meeting areas, making it impossible for minority scientists, especially Blacks, to join with their colleagues. The AAAS knows of over thirty minority science groups, but only about twenty women scientist groups which are separate entities.

Network. Networks serve two important functions. They give members the sense of belonging to a community of like-minded scientists working on similar goals, and they communicate information among members efficiently. Networks often emphasize regional organizing strategies. The Bay Area Math-Science Network, for example, consists of over four hundred members who conduct workshops and other activities in the San Francisco region designed to attract more women to science and engineering, and to enhance the status of those already in these fields. They share information through a central office located at Mills College. The National Minority Women in Science Network has regional chapters in Washington, D.C. and Atlanta, with more planned. They exchange information on grants, educational opportunities, publications, and jobs through a newsletter.

Office or **Project.** Some of the larger scientific societies with a commitment to equal opportunity have established projects or offices in their national headquarters to work on women and minority scientists' concerns. Often, they have been created on the advice of association committees. The offices and projects have at least partial funding for their basic operations from the association, and they search for "outside" money to fund their special activities. The Office of Opportunities in Science (OOS) at the AAAS operates this way. Currently, this Office has a project on women in science, several efforts underway on minority scientists, and a project on handicapped scientists. The Project on Native Americans in Science started at OOS and subsequently moved to Dartmouth College. Offices and projects work closely with the caucuses,

committees, networks, and associations of minority and women scientists. Offices and projects publish reports, conduct studies, maintain rosters, issues newsletters, recommend scientists for boards and panels within the association, arrange meetings, and the like. They vary in which of these functions they take on depending on funding and requests from the scientists they serve.

II. Puerto Rican Scientists' Regional Networks

At the April 1981 conference, several participants volunteered to start networks of Puerto Rican scientists and engineers. The island is well covered, with many universities (Sacred Heart, Inter-American, and the University of Puerto Rico at Rio Piedras and Mayaguez) handled by individual coordinators. The island scientists agreed to discuss among themselves how they would split the area geographically. Several mainland students offered to try to organize undergraduates, particularly in New York City. Regional networks are now being conducted in Boston-Cambridge, Washington D.C.-Virginia-Maryland, Philadelphia, California, and New York City. A list of coordinators as of September 1981 is available from the AAAS Office of Opportunities in Science.

The networks decide on their own goals and manage their own tasks, reporting progress to each other via a "mailbox" at the AAAS which sends memoranda on their accomplishments. So far, these are among the activities undertaken by networks:

- o writing to persons in their region who are in the AAAS directory of Puerto Rican scientists and engineers (published in 1979) to get their current addresses;
- o finding Puerto Ricans not in the directory to add to their network;
- o monitoring activities of other groups useful to their work;
- o sharing information on achievements of Puerto Rican scientists and engineers;
- o helping the AAAS prepare the conference report in which this essay appears;
- o planning the national meeting scheduled for January 4, 1982 (the D.C. network has been especially involved in this because the gathering will take place in their city); and
- o appointing campus coordinators at colleges and universities in their area.

In January 1982, the coordinators and other Puerto Rican scientists and engineers will meet in Washington D.C. in conjunction with the AAAS Annual Meeting. They will review progress on regional organizing and decide what steps should be taken to start a national association.

RECOMMENDATIONS OF THE CONFERENCE OF PUERTO RICAN SCIENTISTS*

Compiled by Karen L. Ehrlich
Administrative Associate, Office of Opportunities in Science
American Association for the Advancement of Science

Esta sección presenta las recomendaciones ofrecidas por aproximadamente un setenta y cinco por ciento de científicos, ingenieros y estudiantes portorriqueños que asistieron a la conferencia de abril de 1981 auspiciada por los Institutos Nacionales de Salud (National Institutes of Health) y la American Association for the Advancement of Science. Las recomendaciones enumeradas son analizados en las siguientes categorías: 1) educación pre-universitaria; 2) educación universitaria y de post-grado; 3) empleo y condición profesional; 4) compilación de un directorio de científicos e ingenieros portorriqueños; y 5) el establecimiento de un sistema de contactos compuesto de científicos, ingenieros y estudiantes portorriqueños.

The following recommendations were put forth by approximately seventy-five Puerto Rican scientists, engineers and students who attended a three day working conference sponsored by the National Institutes of Health and the American Association for the Advancement of Science.** Conferees divided up into small workshop sessions to discuss the status of Puerto Ricans in science and to suggest possible strategies for the improvement of: 1) pre-college education; 2) college education; 3) graduate and professional training; 4) employment, advancement and research opportunities; and 5) the status of Puerto Rican science professionals. The workshop reports were presented to the conference during a plenary session for modification and approval of recommendations to be made by the group as a whole.

In many instances, recommendations made by the workshop groups overlapped and are applicable for more than one of the above topics, e.g., in the case of college and graduate education. For purposes of clarity, the recommendations listed here have been addressed to the following categories:

1) pre-college education
2) college and graduate education
3) employment and professional status
4) compilation of a directory of Puerto Rican scientists and engineers
5) establishment of a network of Puerto Rican scientists, engineers and students

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*The clarity of this section owes much to Rayna Green who chaired this session at the conference, and to Yvonne Benner who provided us with copious notes.

**The recommendations listed here are those of the conferees and do not necessarily represent the view of the AAAS or the National Institutes of Health.

Though not formally a workshop discussion topic, the need for a national organization of Puerto Rican scientists and engineers came up in each group and in the plenary sessions. Discussion of the particulars for the formation of such an organization was deferred until a future meeting, while the establishment of a regional networking system was approved by the conferees as the first step toward organizing. However, the suggestions made by each of the small groups concerning a national organization are included here, not as formal recommendations of the conference, but as "notes" for future consideration.

Recommendations on Pre-College Education

(1) Students should be provided with clear information about opportunities and reasons for aspiring to higher education and careers in science and other professions.

(2) Local and community groups are encouraged to form organizations in order to have more influence on institutions, particularly public schools.

(3) Puerto Rican scientists should work as individuals with students, serving as role models and sources of motivation and information in and out of schools.

(4) The effectiveness of intervention programs should be evaluated and documented, so that successful ones can be supported.

(5) Educators should investigate and make use of existing "hands on" science programs and develop others where needed as a means of motivating students.

(6) Educators should introduce the understanding and use of computers and other technologies to students early because of the importance they will have in most careers in the future, and because of their capacity for stimulating interest among students.

(7) The literature related to heterogeneous grouping of students and the influence of expressed expectations of adults on student performance should be publicized. In view of the literature, the highest expectations should be conveyed to students, beginning at the earliest stages.

(8) Individuals and groups should advocate the states' responsibility to train all students whose primary language is not English as expeditiously as possible in the communication skills that would facilitate entry into the educational mainstream. The crucial need for a parallel program that would suit the needs of non-Spanish speaking pre-college Puerto Ricans should be conveyed to island authorities.

(9) The return to more rigorous academic requirements for all students in the public schools should be advocated. Standards should be set that require all students to take mandatory mathematics and science courses throughout high school.

(10) The concerns of the Puerto Rican scientific community regarding the effects of pre-college academic tracking of students should be conveyed to local school boards as well as state, regional and national educational institutions. These concerns also include the lack of quality teachers, outdated and inadequate curricula, and the possible social reinforcement of educational failure ("labeling") for those students tracked in the lowest educational levels.

(11) The strengthening of English education in Puerto Rico should be advocated. It is proposed that students considering a scientific career be fluent in English.

(12) Puerto Rican scientists and science students should visit high schools to talk about their work, give demonstrations, explain why and how they became scientists, and outline what one must do to prepare for such a career.

(13) Scientific professionals should also invite high school students to visit their workplaces and place them in summer science jobs whenever possible.

(14) The summer science programs in Puerto Rico, such as that run by the University of Puerto Rico, should be commended, and that model and other enrichment activities should be encouraged.

(15) A talent bank of gifted and talented Puerto Rican high school students (both on the island and continent) should be compiled for identifying those youth with promise in science.

(16) Lists of summer science-related work opportunities should be compiled and publicized in order to increase the number of Puerto Rican students applying.

(17) Special efforts should be undertaken to promote the participation of Puerto Rican students in science fairs and to publicize science fair winners.

(18) Big Brother and Big Sister programs should involve more scientists at all sorts of workplaces.

(19) Scholarship funds should be started for mainland students to attend summer research programs in Puerto Rico, and for island students to attend programs on the mainland.

Recommendations on College and Graduate Education

(1) The participants of this conference object to the following:

a) the proposals to eliminate the National Health Service Corps scholarships;
b) the termination of National Science Foundation programs that affect Puerto Ricans and other minorities;
c) reduction of funding of key National Institutes of Health programs that affect Puerto Ricans and other minorities; and
d) reductions in the Basic Education Opportunity grants.

The conferees feel that steps should be taken to restore these programs, and individuals are encouraged to write to Congressman Natcher (with copies sent to Congressmen Stokes, Early and Roybal on the House Appropriations Subcommittee) offering information as to the impact these reductions will have on the education and achievement of Puerto Ricans and other minorities.

(2) The conferees would like to stress the importance of the participation of Puerto Ricans and other minorities in undergraduate research experiences prior to graduate school.

(3) Exchanges of island and mainland students should be conducted with emphasis on research experience in varied settings with different role models.

(4) Hispanic Week programs on campuses should feature scientists as well as the musicians and politicians traditionally present.

(5) Descriptive lists of programs run by mainland universities and colleges on the island should be compiled and distributed in an effort to increase the number of Puerto Rican students who take part in them.

(6) Student preparation for college and graduate school entry testing should be improved for Puerto Rican students. Students should be informed of the benefits of coaching for improved test scores.

(7) There is a need for career orientation for Puerto Rican students, which includes information on:

a) assistance in preparing and submitting college and graduate school applications;
b) academic and financial resources for remaining in school; and
c) graduate and career opportunities.

Recommendations on Employment and Professional Status

(1) There is a critical need for the establishment and use of a networking system for job opportunities. Those Puerto Ricans now in the professions should serve as a point of contact for other Puerto Rican scientists and engineers.

(2) Puerto Rican scientists, engineers and students should be made aware of the importance and projection of a positive self-image and programs for training and obtaining employment.

(3) Students should be encouraged and assisted in developing personal and professional contacts necessary for training and employment in the sciences, and should be encouraged to attend meetings of professional scientific societies while still at the undergraduate level.

(4) Colleges, professional societies and other disseminators of information are encouraged to broadcast the employment and training opportunities which are available through government and industry. Industry should make concerted efforts to make itself aware of these opportunities — again, often through the use of networks and professional societies.

(5) Professional societies are urged to consider the special needs of scientists and engineers who are parents when planning their meetings, e.g., providing child care facilities.

(6) Groups such as churches and clubs should be encouraged to disseminate information about scientific work done by Puerto Ricans, and serve as loci for seeking young people who should know about science careers.

(7) Spanish media such as the San Juan Star, El Mundo, Nuestro and Agenda should profile prominent Puerto Rican scientists.

Recommendations for Compiling a Directory of Puerto Rican Scientists and Engineers

In the spring of 1979, under the direction of its Panel of Puerto Rican Scientists, the AAAS Office of Opportunities in Science compiled a directory of Puerto Rican scientists and engineers residing both in the continental United States and in Puerto Rico. The directory was produced to serve as a networking device among the 400 individuals listed. The participants at this conference strongly recommend the compilation and publication of a second edition of the directory with modifications as follows:

(1) The new version requires a more complete convass of those on the island of Puerto Rico.

(2) A more exhaustive list of mainland scientists and engineers is also necessary.

(3) Those who define themselves as "Puerto Rican" should be included. The directory staff need not articulate a definition of who is or who is not Puerto Rican.

(4) Students should be listed separately, or an index of students should be added, with categories by major.

(5) The questionnaire for the directory should ask for more information than was requested for the first edition. Questions should be added on personal history (birthdate, etc.) and professional attainments (publications, research, work history, etc.). These data may not need to be printed in the book, but should be tabulated and reported in a new introduction which presents a collective profile of those in the book. The computerization of directory information is encouraged.

(6) The AAAS should release its copyright on the book's first edition to the group which does the second. The AAAS should also provide technical assistance regarding the first directory and conference which would be useful in compiling a new edition.

(7) The compilers of the book should work closely with existing organizations on the island and continent asking for names of individuals to be included, space in journals for ads and notices on the book, etc. Persons at schools with many Puerto Rican faculty and students should serve as liaison officers for the directory, drawing up lists of those who should be canvassed about it. Regional meetings of Puerto Rican scientists should publicize the effort to issue a new directory.

(8) Costs of compilation could be covered by dues income of a group, sales of the book, or outside funding (industrial support from pharmaceutical, electronics or computer companies, government agencies or foundations). The advice of Representative Garcia and Commissioner Corrado del Rio should be sought in where to apply for funds.

(9) The directory should be widely used, such as for inviting scientsts to serve as role models at high school career days, or requesting assistance in admission to graduate school and in seeking jobs.

(10) The best organization to produce the new edition is a group of Puerto Rican scientists and engineers.

Notes on Forming a National Organization of Puerto Rican Scientists and Engineers

In each of the five workshops and throughout the conference, the need for a formal national organization of Puerto Rican scientists and engineers was vocalized and discussed in detail. Recognizing that any organization first needs a mechanism for communication, the conferees recommended that a system of regional networks be set up to identify individuals interested in participating in the formation of a national organization. An organizing committee of "regional coordinators" from among the conferees will begin networking activities in the following geographical areas: New York, Philadelphia, Boston, Washington, D.C., California, Puerto Rico and the Virgin Islands. Specific recommendations concerning the establishment of regional networks and contacts include:

(1) Anyone interested in the promotion, enhancement and dissemination of science among Puerto Ricans is eligible to participate in the network.

(2) Regional coordinators and volunteers from the conference will be members of the organizing committee. The composition of this committee will be open to include other volunteers.

(3) The organizing committee should meet again as soon as possible to discuss working agenda, and regional groups are encouraged to meet for the same purpose.

(4) The AAAS Office of Opportunities in Science shall act, for the time being, as facilitator for the coordination of information received from the regional networks.

The establishment of regional networks as a means of starting an organization was recommended and approved by the conferees during the plenary session following the workshop sessions. However, several of the workshop groups put forth suggestions on the formation, structure and purposes of a national organization of Puerto Rican scientists and engineers. These are listed here and will be taken up in future discussions.

Purpose of the National Organization

(1) To disseminate information in order to promote the participation of Puerto Ricans in all aspects of science and engineering.

(2) To promote interaction among Puerto Ricans on the island and continent.

(3) To encourage Puerto Rican students to major in science, engineering and biomedicine and to provide students with career counseling.

(4) To establish affiliations with professional scientific organizations.

(5) To establish liaisons and maintain contact with groups with similar goals (such as the Society for the Advancement of Chicanos and Native Americans in Science).

(6) To enhance the image and publicize the achievements of Puerto Rican scientists and engineers.

Suggested activities for the national organization include:

(1) Developing a newsletter containing information on:

a) job placement and career orientation
b) financial aid for education
c) research grant application deadlines
d) developments in legislation and affirmative action matters
e) meetings and events of interest to students and professionals
f) publications and research by Puerto Rican scientists and engineers

(2) Compiling a new directory of Puerto Rican scientists, engineers and students.

(3) Providing scholarship monies to Puerto Rican students interested in pursuing college and graduate studies.

(4) Conducting annual meetings for presenting scientific research, recognizing outstanding work by awards, and conducting the organizational business of the group.

(5) Maintaining an information clearinghouse for members to answer questions on jobs, financial aid for education, etc.

(6) Facilitating the start and operation of regional chapters and student chapters of the national organization.

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The citations in this bibliography are those that have crossed the desk of the author since she worked with Yvonne Benner on compiling the directory of Puerto Rican scientists and engineers. Since several bibliographies on Puerto Ricans have appeared during the 1970s, the list includes only very recent entries. Among the bibliographies that should be consulted for earlier works are the following:

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APPENDIX A

FINAL AGENDA

CONFERENCE OF PUERTO RICAN SCIENTISTS
NATIONAL 4-H CENTER
April 22-24, 1981

Jointly Sponsored by:

American Association for the Advancement of Science
NIH Division of Research Resources
NIH Division of Equal Opportunity
National Cancer Institute
National Institute of General Medical Sciences
National Institute of Neurological and Communicative Disorders and Stroke
National Institute of Allergy and Infectious Diseases
National Institute of Arthritis, Metabolism and Digestive Diseases
National Institute of Child Health and Human Development
National Institute of Dental Research
National Institute on Aging
National Eye Institute
Fogarty International Center

Wednesday, April 22

10:30 - 12:30	Registration
12:30 - 2:00	Lunch and Introduction to the Conference Dr. S. Maria Hardy, Conference Chair, and Dr. Zora Griffo, NIH
2:00 - 5:30	Plenary - Discussion of Background Papers Yvonne Benner, Office of Personnel Management, Chair
	Education of Puerto Ricans in the United States - Rafael Valdivieso, Director, ASPIRA Center for Educational Equity
	Status of Puerto Ricans in Science: The Island - Dr. Manuel Gomez Rodriguez, Dean of Science, University of Puerto Rico, Rio Piedras and Director, Resource Center for Science and Engineering
	Status of Puerto Ricans in Science: The Mainland - Dr. Pedro Barbosa, University of Maryland
	Combating Stereotypes: Role Models, Media and What Else? Self-perception, Self-assessment and Career Choices - Dr. Candida Acosta, Dean of Academic Affairs, University of the Sacred Heart, Santurce, Puerto Rico and Dr. Harold Stolberg, National Science Foundation
5:30 - 7:00	Reception

7:00 - 9:00 Buffet Dinner

Panel on Programming for Puerto Ricans in Science - Dr. Shirley Malcom, Program Head, Office of Opportunities in Science; Dr. Ciriaco Gonzalez, Director, NIH Minority Biomedical Support Program; and Mr. Elward Bynum, Director, MARC Program

Thursday, April 23

7:00 - 8:30 Breakfast for lodgers

9:00 Concurrent Workshops on the Partcipation of Puerto Ricans in Science and Biomedicine

a) Pre-College Education
b) College Education
c) Graduate and Professional Training
d) Employment, Advancement and Research Opportunities in Science and Biomedicine
e) Enhancing the Status of Puerto Rican Science and Biomedical Professionals

(Each of the workshop discussions will focus on the role of professional societies, community groups, NIH, other government agencies, and the private sector in addressing the problem of the underrepresentation of Puerto Ricans in science and biomedicine. Discussion of the topics will continue over lunch and recommendations formulated in post-luncheon discussions until 2:00.)

12:00 - 1:00 Cafeteria Lunch

1:00 - 2:00 Continue morning discussions

2:00 - 4:00 Students and Scientists Panel

4:00 - 7:00 Opportunity for discussion groups on other topics as identified by the participants. The following have been suggested:

Bilingual Education: Does It Work? Help or Hindrance for Science and Math?

Are Federal Equal Opportunity Efforts to Employ Puerto Rican Scientists and Engineers Sincere?

Organizing for the 80's: Establishment of Regional Networks and Contacts...Communication Between Mainland and Island Scientists

Are Racial Differences Among Puerto Ricans Relevant in Science?

7:00 - 9:00 Banquet Dinner
Speakers: Major General Enrique Mendez, M.D. (Deputy Surgeon General, U.S. Army)

Dr. William Raub (Associate Director for Extramural Research and Training, NIH)

Friday, April 24

7:00 - 8:30	Breakfast for lodgers
9:00 - 12:00	Plenary discussion of workshop findings and recommendations, Dr. Rayna Green, Chair, Director, Native American Science Resource Center, Dartmouth College
12:00 - 1:30	Checkout and cafeteria lunch
1:30 - 3:00	Organizational Models - Dr. Maria Hardy, Chair
3:00	Adjourn

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NATIONAL 4-H CENTER
BETHESDA, MARYLAND

April 22-24, 1981

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APPENDIX B

For other news coverage, see Chemical and Engineering News, May 25, 1981, p.30

Puerto Rican Scientists Call for New Organization and Reforms in Science Education

At a recent meeting, Puerto Rican scientists and science students called for the creation of an organization to serve their interests and drafted recommendations for increasing their number and status in scientific, biomedical, and technical fields.

The meeting was held 22–24 April in Bethesda, Maryland, under the auspices of the AAAS and 12 institutes and divisions of the National Institutes of Health. Seventy-five Puerto Rican scientists, engineers, and students, mostly from the mainland United States, presented background papers, held work sessions on topics arranged by educational level, and heard panelists and speakers. The conference was chaired by S. Maria Hardy, physiologist, Louisiana State University at Shreveport, and chairperson, AAAS Committee on Opportunities in Science (OOS).

The conferees decried federal budget cuts which they perceived as conflicting with their goals. Among those cuts are: (i) proposals to eliminate the National Health Service Corps scholarship; (ii) proposed termination of National Science Foundation science education and research support for minority scientists; (iii) reductions in funding of the major NIH programs for minorities in biomedicine; and (iv) cuts in the Basic Educational Opportunity Grants.

Calling the distinction between mainland and island an artificial one, conferees called for much closer interaction and exchange through both formal and informal means. Puerto Rican scientists may work part of their professional lives in Puerto Rico and part on the mainland, so the meeting asked for a unified scientific association which includes both locations. However, on matters of education policy, inherent difference must be taken into account. For example, a resolution on bilingual instruction must note the native language.

Controversy surrounding the practice of "tracking" students by ability level, methods and objectives of organizing, and other topics surfaced during the meeting. The subject of statehood versus independence for the island was talked about among scientists between sessions but did not result in a formal resolution.

Recommendations which were endorsed included the following:

Mendez (left) and Raub at meeting of Puerto Rican scientists. [Photo Cesar Rodriguez]

1) Materials should be produced which publicize the achievements of Puerto Rican scientists to encourage Puerto Rican students to think about such careers.

2) Wider dissemination should be made of traveling exhibits which offer students "hands on" experience in science to motivate them to pursue further study in technical fields.

3) The director of Puerto Rican scientists must be updated and computerized for use in role model projects, network creation, and peer review assignments by science agencies.

4) Career orientation programs should be initiated to brief Puerto Rican (and other) students on graduate school application, financial aid, and the availability of academic resources, and research opportunities for undergraduate students.

5) Student attendance at scientific meetings should be encouraged as a way to learn how scientists conduct their business and to establish contacts.

6) Churches, Puerto Rican clubs, and Spanish language media should be used to disseminate information about science and scientists.

The scientists decided to set up regional networks around the United States and on the island as a prelude to creating a national association, which might be formed next January at the AAAS meeting in Washington, D.C. Besides the island, regional centers are proposed for New York, California, the Rocky Mountains states, Boston, Philadelphia, and Washington, D.C., with possible future sites in Texas, the Southeast, and the Chicago area.

The Office of Opportunities in Science at AAAS will serve as "mailbox" for the regional groups until the national organization takes over the function.

Conference speakers included Major General Enrique Mendez, deputy surgeon general of the United States Army and currently the highest ranking Puerto Rican in the military. Mendez pointed to the positive effect of the long tradition of Hispanic culture in the United States and its notable absence from publications chronicling American history. The National Institutes of Health provided two speakers, Zora Griffo, special programs officer, and William Raub, associate director for extramural research training, both from the Office of the Director.

Also addressing the meeting was Rafael Valdivieso, director of the ASPIRA Center for Educational Equity in Washington, D.C., who outlined various studies done on the schooling of Puerto Rican students, with special reference to their training in science and mathematics. Manuel Gomez Rodriquez, dean of natural science and director of the resource center for science and engineering at the University of Puerto Rico, discussed the status of Puerto Ricans in science on the island, while Pedro Barbosa, entomologist at the University of Maryland, discussed the situation on the mainland.

For further information, contact Karen Ehrlich, OOS, at the AAAS address.

MICHELE ALDRICH
Office of Opportunities in Science

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Founded in 1848, AAAS is the world's leading general scientific society with 130,000 individual members. It is also the world's largest federation of scientific organizations, with nearly 300 affiliated societies and academies covering the entire spectrum of the natural and social sciences, engineering, and medicine. Despite its size and complexity, AAAS offers its individual members a voice in the larger scientific community through programs for the expansion and interchange of ideas in science and engineering and in the public understanding and appreciation of science. AAAS membership includes the weekly journal SCIENCE and the opportunity to participate in one of the twenty-one AAAS Sections of the Association that embrace the basic fields of science and engineering. Members also take part in programs that contribute toward the solution of problems affecting not only the scientific community but society as a whole.

For further information about AAAS, write

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AAAS provides for the interchange of information of concern to scientists and to the public through

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- SCIENCE BOOKS AND FILMS, a critical review journal, and the AAAS Sourcebook Series (compiled from SB&F) which review or annotate and list the best science books and films currently available.
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- relaying reliable science information to the news media.
- promoting public understanding of science and improving science curricula in the schools.
- improving international cooperation among scientists through innovative ventures like the inter-American trilingual journal INTERCIENCIA.
- expanding the opportunities available to minorities, women, and the handicapped in all fields of science.